# The Builder.

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## *Unwritten Ideals, Professional and Artistic.*

PROBABLY not only every profession or pursuit, but every trade or business also, owns some ideals by which those who pursue it are governed, though they do not take the form of propositions reduced, or always reducible, to writing. The trade ideal (if it can be called an ideal) is to get the best price possible for your goods, and to persuade the purchaser that they are exactly what he wants, and that he could not get them so well anywhere else. This, though an unwritten and unspoken maxim, is so universally understood and acted upon that it perhaps furnishes its own antidote, as far as the caution of the purchaser is concerned. "Caveat emptor" has passed into a proverb; it is understood that seller and buyer are natural enemies; if the purchaser is taken in, it counts one to the vendor. It is possible to conceive a state of society in which every one endeavouring to sell any commodity should confine himself to a candid statement of the exact facts about it, as known to himself; but we should have arrived at the golden age then.

The line which separates trade from professions and arts is marked perhaps, more especially than by anything else, by the fact that the latter are precluded by their recognised ideals and standards of conduct from making professions or from openly seeking employment; and that in theory at least their object is to benefit their employers and the world at large. That this high ideal is always acted upon is more than can be said, or we should (again) be in the golden age; but it exists as a recognised influence and principle. There are standards of conduct *inter se*, moreover, which are unwritten but not the less recognised and almost universally acted upon by men in the liberal professions. For a tradesman to try to undersell his rival is, from the trade point of view, a virtue; in the professional man it is a vice.

It seems to have occurred to Mr. E. H. Pitcairn that by persuading various eminent professional men to write down their view of the unwritten ideals which permeate their various professions, "a useful and interesting book might be compiled."* The result is a book which is certainly amusing reading, though we do not know that for the most part it counts higher than that. We get from the opening chapter, "Ambassadors," some idea of the delicate and important questions of ambassadorial precedence and etiquette, which are at all events new to many of us. Mr. Augustine Birrell throws some light — not so new however to the outsider—on the curious point of view from which human affairs are regarded by the race of "learned counsel." Over essays the bulk of which deal with subjects out of our province we must however pass lightly; only mentioning what strike us as the two best points made in the book in regard to the influence of ideals. The one, which in fact suggested our opening remarks, is from Dr. Brudenell Carter's chapter on the medical profession, in which he points out that "nothing but what is true can live in medicine, and the mind of the medical man becomes attuned to truth as the sole condition with which it can be in harmony."

> "With merchandise, on the other hand, men deal for the single purpose of getting gain, and their profits would often be greatly diminished if truth were to be exacted from them. Their profits are largely derived from unnecessary enhancement of the prices which consumers are made to pay for commodities; and the enhancement is frequently effected by means of false representations. In one case we have to do with a man who seeks to know what is true, and who brings to others the aid of what he believes to be truth for a fixed and reasonable recompense; in the other we have to do with a man who often endeavours to conceal the truth, in order that he may obtain from others the largest possible amount of profit. The difference seems to be radical and essential, and to have existed from all time."

The annals and the habit of mind of the medical profession, in our opinion, fully endorse the proud position here taken up. It is a well-paid profession, because it is so necessary to humanity, and because people who can afford it will bid high for the advice of the ablest men; but there is perhaps no profession in existence in which truth for its own sake is more emphatically the object of pursuit. The other point we referred to, and one which should come home to the English public at the present moment, is made in General Maurice's chapter on "The Army." After alluding to Wellington's extraordinary reticence, which was practised even towards his immediate subordinates, in regard to his intentions in a campaign, by which he avoided the possibility of his designs leaking out to the enemy, he says, "a modern general is surrounded by a number of people who follow a different unwritten law," namely, the Press correspondents, whose primary principle is to obtain all the news possible to send home to their paper; and he adds, "The country which prefers to get early news of exciting events rather than to secure success in war, is likely to have news which will unpleasantly excite it."

Civil engineering is not among the professions which have been asked for a spokesman, and the subject of the Royal Engineers is dealt with mainly from the military point of view. We now come to the only two chapters in the book which are within our special province; that on "Art," by Mr. G. F. Watts, and on "Architecture," by Mr. Waterhouse. Mr. Watts's chapter is not indeed written by himself; according to the rather oddly-expressed foot-note—"Mr. Watts not being able to write, notes of a conversation were taken down at the time." We are not told in what sense Mr. Watts is "not able to write," but he corrected the proofs of the conversation, so we may assume that we have his ideas, at all events, and the editor's punctuation, which is very faulty. Mr. Watts's chapter is one of the few in the book which is entirely serious and earnest in tone, as of a man dealing with what he feels to be a very grave subject. And the first point which Mr. Watts takes up is, again, that of the superiority of the artist to

* "Unwritten Laws and Ideals of Active Careers." Essays: Edited by E. H. Pitcairn. London: Smith, Elder, & Co. 1899.

mere considerations of gain. He admits that we cannot live now, "like the great artists of old, on bread and onions followed by a few grapes" (he should have added that we do not live in Italy, for climate has something to do with living), but he maintains that in the older days of art, though the artist was paid, "money was never the inspiring motive"; an unwritten ideal by which we have no doubt that Mr. Watts loyally holds. "A great school cannot exist," he adds, "unless beauty is loved for its own sake"; and he considers that it is the lack of beauty in modern life which has killed the highest intellectual art. A French picture of "a row in a *café*" may be true to life, "but this can be said of much that is disagreeable"; in which words we may read, presumably, Mr. Watts's condemnation of the painter of "La Rixe." But "La Rixe," and others of Meissonier's works, are, for all that, pictures with a great style about them; and, in the intellectual sense, a great style may dignify a commonplace subject; that is one of the indefinable powers of art, which is felt but the principle of which can hardly be expressed in words. In what he says of Hogarth, just afterwards, we quite agree. What Hogarth wanted was a great style. "The highest intention and admirable embodiment is to be found in Hogarth; but the material conditions not permitting of an appeal to a sense of nobility. . . . . he was forced to speak in a dialect"; a very sound and true piece of criticism, which is likely to be remembered.

Mr. Watts quotes Cennini's maxim—"Before beginning a painting, go down on your knees and pray"; and observes that "this earnest endeavour is not called for by Englishmen. With a few rare and conspicuous exceptions artists spend their time in making toys for the annual exhibition, which few people consider to be more important than a maypole." Mr. Watts, however, exhibits in more than one annual exhibition, and if there are numbers who think such exhibitions "no more than a maypole," there are nevertheless not a few who take a serious interest in them, and rejoice to find there anything approaching to a great picture. Mr. Watts is somewhat too pessimist. And he makes an important admission further on—one more far-reaching than he seems to recognise—in the remark that "the artist, like the poet, must speak the language of his time. Only thus can he naturally express himself, only thus can he directly appeal to those whom he addresses." It is the persuasion of some not altogether thoughtless persons that Mr. Watts himself does not speak the language of his time; that he is endeavouring to set up in the nineteenth century the art of a different age; and that hence his own future position as an exponent of nineteenth century art is endangered. Millais did speak the language of his time, and is *pro tanto* the more true artist, though his ideals may not have been so high.

Some remarks on portrait painting are interesting for the light they throw on the characteristics of Mr. Watts's own portraits.

"A faithful likeness should certainly be aimed at, but it must not end there; the sitter's character, his disposition, his profession should be pourtrayed, thus making the face the window of the mind. An endeavour should be made to find out by conversation the highest thoughts, dispositions, and characteristics of the sitter. At the same time the smallest physical minutiæ should be carefully observed and studiously reproduced. If successful, the *artist* will be forgotten."

This is admirably said; but does not a danger lurk in this ideal of portrait painting—the danger that the "physical minutiæ" may be somewhat overlooked in the effort to convey an impression of the sitter's intellect, or of the artist's conception of it? And is this the reason that some of Mr. Watts's finest portraits—finest in the pictorial sense—give one the impression of being not so much the portrait of the sitter as the representation of Mr. Watts's conception of what he ought to look like?

There is one point in the artist's ideal which Mr. Watts has not touched upon in so many words, though we have no doubt it was present in his mind, viz.: that a true artist will only offer to the public the best that he can conceive and execute, and will not produce for them that which he knows to be inferior, to suit their tastes. That is one of the most striking distinctions between the artistic spirit and the trade spirit. We fell in with a curious example of this some years ago, when we published an article ridiculing the vulgar taste in English goldsmiths' work and jewellery—the imitations of horseshoes, chicken-bones, and other such absurdities. A well-known jeweller wrote that he was entirely in sympathy with us, and hoped that if we saw his collection of work we should recognise that he was aiming at something higher. Yet in the window of this jeweller's establishment were to be seen, exposed for sale, specimens of the very vulgarities we had been denouncing. He knew that they were bad, but the public wanted them, and he was willing to sell them. That is the difference between an artist and a tradesman. No artist would have done that.

Mr. Waterhouse's chapter on "Architecture" contains, as might be expected, a great deal of sound sense, but does not entirely answer to the title of "unwritten ideals." He takes the opportunity of explaining to the public a good deal about the architect's position in relation to his clients; about architectural education and the effect on it of the Institute system of examinations; all which it is useful that the public should know. But surely payment by 5 per cent. commission is not an "unwritten ideal." It is not recognised by law, but it is "written" in the Institute scale of charges. Is it an "ideal" at all? It is certainly not an ideal mode of payment for any building which is a work of art, and we should have been rather glad to have seen a higher ideal suggested. Mr. Waterhouse remarks that, as the result of this system, "the fees of the best architect are no higher than that of the worst"; but then every one knows that the best architect is almost forced, in consequence, to take more work than he can give his personal attention to, if he wishes to make a fortune out of his reputation. There is a higher ideal than that—a very "unwritten" one; that of carrying one or two great buildings to perfection, and being content with that and with the modest gains accruing from it. Thus, Duc devoted himself entirely to his Palais de Justice, in the true spirit of an artist. This is an ideal we rarely hear of, and perhaps, in the present state of Society, almost too difficult of realisation; but its possibility should be recognised.

In regard to the mutual relations of architects, it is rare indeed, as Mr. Waterhouse remarks, to find an architect go behind his brother to defraud him in anything, or wantonly pull about or alter the work of his predecessor.

"No architect who respects himself will ask for work" (a maxim as old as Vitruvius), "unless indirectly by joining in a competition. Work comes none the less in the long run by scrupulously observing this rule. The times have certainly changed for the better since the leader of the profession did not hesitate to take round his portfolio of designs to those personally unknown to him, who were supposed to have the erection of a church in view."

Men of the younger generation will wonder who this architect was, who is left un-named; and we prefer not to enlighten them, or *infandum renovare dolorem*. He could not have done it now, at all events. But while Mr. Waterhouse's statement as to ideals of inter-professional conduct is quite true in the main, there is one point in which there might be an improvement, viz: in the tendency of architects to depreciate each other's works in private conversation. To be sure, this does not arise from jealousy, but from a tendency among architects, and more especially among the younger generation, each to think that his own feeling about the artistic treatment of architecture is the true one, and that every one else is wrong. This is a narrow way of feeling, in an artistic sense; but it also leads to an ungenerous professional attitude. Let architects take example from the medical profession. When will you hear a doctor speak slightingly, in general conversation, of another doctor? It is an unwritten law of the Faculty not to do so; and a very praiseworthy one.

We may conclude by citing the closing passage of Mr. Waterhouse's chapter: "A nation's history is revealed in its architecture; our aim therefore should be to make our architectural work as enduring as in us lies, and, by its direct adaptability to the requirements of the day, illustrative of our national character and aspirations. It goes without saying that it should be beautiful and dignified, free from mere conceits of fashion and puerilities of any sort. Each should strive that his share in this writing of history should embody his own best thoughts, and be a worthy memento of the extraordinary times in which we live." And this is a fine expression of the broadest unwritten ideal possible in architecture.

## SOME CONSIDERATIONS ON THE STRENGTH OF MATERIALS.

SUBJECTS apparently commonplace are frequently found by thoughtful minds to be both interesting and instructive, leading the inquirer through devious paths of thought, laying bare much of the economic working of nature, and bringing him finally to the contemplation of mysteries whose secret has hitherto baffled human intelligence.

With regard to our material world, the limits of knowledge are soon reached. All around are things, animate and inanimate, which we assume to consist of matter. Whether matter really exists we do not know; its ultimate nature cannot be ascertained, and it is only rendered evident as something affecting the senses, or as acted upon by force. In our present state of

knowledge we suppose material substances to consist of variously grouped elementary atoms. These we imagine to be chemically indivisible, although theoretically capable of further reduction by mechanical means. Assuming atoms, as ordinarily understood, to have actual existence, we do not know the nature of their constituent matter; we cannot prove whether the so-called elements are really distinctive, or whether they in turn consist of a primary substance common to the universe. Thus the inner workings of nature are hidden from the perception of man, and practical knowledge of materials in every-day use by architects and engineers is, comparatively speaking, of the most rudimentary character. Nevertheless, results, achieved by indefatigable experimentalists, are daily being accumulated, and fairly comprehensive information is therefore accessible to all who may desire it for professional guidance.

In every form of construction there are involved considerations with respect to the strength of materials, and it is invariably desirable that these should be selected with special reference to their suitability for any given duty. Strength is not the only qualification, inasmuch as durability, appearance, specific gravity, cost, and other characteristics have to be borne in mind. Again, and from another point of view, strength alone is not to be taken as the chief criterion by which a constructional work is judged; for stability and cohesion must be secured by the application of material in the most advantageous manner and without excess. Hence any complete exposition of the materials of construction should cover three main aspects of the subject: (*a*) the physical properties which bodies or structures possess as to strength and elasticity; (*b*) their physical and chemical characteristics; and (*c*) the effects produced upon bodies or structures by different kinds of stresses and strains.

Not only is the subject thus capable of analysis, but so somewhat similarly are its students. On one hand we have those who are already familiar with the mathematical theorems involved, and who are generally acquainted with the subject; whilst on the other hand we have students who, knowing little or nothing, are anxious to learn all that is conveniently possible. Numerous books of reference are available for use by the first of the two classes, but unfortunately few of the results contained therein are of recent date, and most of them have been obtained from experiments upon test pieces of limited dimensions. It cannot safely be argued that chemical and physical qualities observed in a small specimen will necessarily exist in material supplied in bulk; natural products, such as timber, are found to exhibit divergencies according as the tests are conducted on large or small pieces, and the reliability of compound structures may not be deduced solely from results furnished by small test bars of material. We think, therefore, it is evident that room still exists for concrete records of recent scientific investigations, carried out with the aid of the most accurate apparatus and knowledge.

Coming now to the student class, we recognise the fact that some explanation of first principles is necessary in order that due appreciation of the subject may become possible, and in this connexion we can appropriately make reference to a treatise on "The Strength of Materials"* by Mr. J. A. Ewing, F.R.S., &c., Professor of Mechanism and Applied Mechanics in the University of Cambridge. As the author observes, "the term 'Strength of Materials' is used in a somewhat wide sense to name that part of the theory of engineering which deals with the nature and effects of stresses in the several parts of engineering structures." It is also employed to indicate resistances exhibited by various materials under stress, and we think confusion would generally be avoided if in future writers could agree upon the adoption of distinctive titles for works dealing respectively with theoretical and practical aspects of the subject. Throughout his excellent treatise, Professor Ewing adopts such clearly defined classification and writes with such happy lucidity that we are tempted to regard the sentence quoted above as a gentle protest against the use of technical terms in a "wide sense." The intention of the author has been to exemplify a lecture-room treatment of the subject, which to be productive of the desired result needs to be supplemented by laboratory and drawing-office work. Naturally, therefore, the scheme is largely of mathematical character; but, as we shall show, it is one admirably adapted to place the student in possession of such information as will equip him properly for successful prosecution of his task. Some part of the book is virtually the reproduction of an article contributed by the author to the ninth edition of the "Encyclopædia Britannica;" and in the useful chapter dealing with Testing Machines and allied appliances, one or two illustrations are taken from Professor Unwin's invaluable work on the "Testing of Materials."

In order that tests may be intelligently made, and that published results may be adequately appreciated, a certain amount of mechanical knowledge is absolutely necessary. The exact nature of stress in simple and complex states must be known, as also the effects produced thereby in solid bodies. These effects are expressed by the aid of constants, such as the modulus of elasticity, the modulus of rigidity, the modulus of cubic compressibility, and the ratio of lateral contraction to longitudinal extension. Further, it is desirable that the established connexion between these constants should be clearly recognised. Carrying strains beyond the elastic limit, it is found that the object becomes to some extent plastic, and that as the load is increased plasticity usually becomes more and more pronounced until finally a point is reached at which rupture results. Thus the measure of ultimate strength may be established, but it is interesting to find that between the elastic limit and the breaking point variable effects are produced according with the manner in which a load is applied, and with the position reached on a scale extending from one limit to the other. Metals are further found to possess powers of recovery after overstrain, whilst they also exhibit the remarkable, although undesirable, property known as "fatigue" when subjected to repeated changes of stress. A similar effect may be brought about through the cumulative influence of shocks or blows, which tend to destroy plasticity, to produce hardening, and to result in failure. These are some of the points which the experimentalist has to consider as suggesting or qualifying simple tests upon materials.

In Professor Ewing's treatise several forms of testing machines and of kindred appliances are fully described, including Wicksteed's single lever and horizontal machines, and others by Werder, Kirkaldy, and Emery, for tension and compression tests. Notice is also taken of machines for special purposes, such as the determination of the tensile strength of cement in briquettes, and the transverse strength of cast iron; also for the examination of bodies under torsion, and for measurement of elasticity in various ways. Some results of tests are briefly stated, and useful hints are given with regard to the forms of test-pieces, and to their attachment in tensile tests.

Up to this point, the work to which we have referred deals with theoretical principles underlying testing operations, and the practical aids by which such tests are conducted. The remaining chapters are devoted to matters some of which relate more especially to the strength of structures in which intrinsic strength is largely qualified by other factors. In these chapters, practically, but not ostensibly, constituting Part II. of the treatise, there are discussed uniform and uniformly-varying distributions of stress, stresses in beams, deflection of beams, continuous beams, frames, struts and columns, shells and thick cylinders, hanging chains and arched ribs, and the torsion of shafts. Actual tests of complete structures are, of course, more or less superfluous, as no testing load beyond the ordinary working load can ordinarily be applied. Consequently, in such cases the architect or engineer must rely largely upon the aid of theoretical knowledge. As to research with regard to the actual strength of materials themselves, it should be observed that tests may be conducted either for the purpose of obtaining comparative results or for the attainment of knowledge. Inquiry of the first kind is by no means to be undervalued, as the practical designer is thereby enabled to ascertain that materials of suitable quality and strength are being furnished. Investigation coming within the scope of the second category is devoted to a determination of physical constants, to the verification of data upon which calculations are based, and to the discovery, if possible, of hitherto unknown phenomena. It is a hopeful sign that educational bodies show an increasing tendency to recognise the importance of physical research, and to encourage its practice by their students. To this useful work Professor Ewing has contributed not a little in the past.

* "The Strength of Materials." By J. A. Ewing, M.A., B.Sc., F.R.S., M.Inst.C.E. Cambridge University Press. 1899.

## NOTES.

Vauxhall Bridge.

WE print on another page a letter addressed to the Clerk of the London County Council by the Secretary of the Institute of Architects, embodying the views of the Institute Council on the subject of the design for the new Vauxhall Bridge, and the reply of the Clerk of the County Council. With the criticisms of the Institute we are entirely in agreement, except perhaps as to the suggestion that a solid parapet would assist the appearance of solidity which the bridge design now lacks. The point is worth consideration, bu

to our thinking the substitution of a solid wall for the usual open balustrade would be more a loss than a gain to the architectural effect. What we particularly wish to draw attention to, however, is the closing sentence of the letter from the County Council, to the effect that the structure is one which "necessarily, and according to all precedent, falls within the business of the engineer's department." This is of course inserted as an answer to the repeatedly expressed wish of the Institute of Architects, and of other persons interested in the architectural improvement of London, that an architect should be employed in conjunction with the engineer, to design the details of the bridge. The sentence is a reiteration of their *non possumus* attitude on the question, which is perfectly unreasonable. In the first place, even if it were true that all precedent were in favour of a great City bridge being considered solely as a work of engineering, with which architecture has nothing to do, it is a bad precedent, and it is time that it were superseded. But as a matter of fact it has been pointed out to the London County Council over and over again—by the Institute, in our own columns, and in letters in the *Times*—that the "precedent" is only an insular one; that in France, for a long time past, it has been the general custom, in the case of an important bridge, especially in the capital, to appoint an architect to design the architectural portion of the bridge and to work in conjunction with the engineer. The County Council must be aware of this, but are merely determined obstinately to shut their eyes to it, because, in spending a large sum of public money on a public work, they prefer to consider the prejudices of their engineer rather than the wishes of the best educated portion of the community.

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The Philadelphia Tunnel and Subway.

AMONGST other indications showing that American cities are gradually becoming subject to conditions which have been found essential in great centres of population in the Old World, the works now nearing completion in connexion with the Philadelphia and Reading Railway deserve no insignificant place. In former days it was apparently not considered as constituting any abnormal state of things, in America, that a railway train should go gaily careering through the streets of a city; but in Philadelphia the existence of a railroad on one of its principal avenues seems not to have been entirely appreciated. It is now about nine years since the municipality authorised the extension of the Philadelphia and Reading Terminal Railroad to Market-street on condition that bridges should be constructed where the "tracks" crossed some of the more important streets. After one of these bridges had been built, it became palpably evident that a similar erection on the line of Broad-street would not only seriously damage valuable property, but would also be objectionable as ruining an avenue, supposed locally to be one of the finest streets of the world, and which is largely used for civic and other displays. Beyond these considerations, there remained the fact that sixteen dangerous level crossings would still remain. Consequently, it was decided that the railway should be depressed so as to pass partly through a tunnel and partly along an open subway crossed by bridges where necessary for ordinary traffic. The total length of the work involved is about two miles, and accompanying the formation of the tunnel subway there has been necessitated the reconstruction of all the goods yards, engine depots, signal buildings, as well as sidings to various manufactories, among which may be mentioned the well-known Baldwin Locomotive Works. The alterations to which we have referred were further complicated by the fact that it has been necessary to reconstruct the sewage system to a considerable extent, as well as to modify the arrangement of gas and water mains and electric conduits. The work is now practically completed, and will constitute a great improvement to the city. In the future we shall probably hear less of such heroic undertakings in American cities, because the authorities are likely to refuse sanction to any works unless they are first satisfied that all the essential conditions have been duly considered and satisfied.

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The Corrosion of Alloys by Sea-Water.

SOME interesting details of an investigation made by the German Admiralty to ascertain the action of sea-water upon various alloys were recently published in the *Scientific American*. Copper, zinc, tin, aluminium, and iron-aluminium alloys were examined. It was found that iron, tin, and aluminium alloys exhibited very little change after immersion in sea-water alone; but that when iron and tin alloys were placed in contact and immersed, a serious deterioration of the iron alloy occurred; one specimen, after two years' immersion, lost two-thirds of its strength, four-fifths of its elongation, and was partially destroyed by chemical reaction. From the results of the experiments the Admiralty conclude that when metals and alloys are subjected to the action of sea-water, only those metals which are near to one another in the electrical scale should be allowed contact. Thus, while pure aluminium bronze is scarcely attacked at all by sea-water, when immersed in contact with metals which are electro-negative towards it, contact with an electro-positive metal causes the bronze to be destroyed with comparative rapidity. It is probable that the same law would apply, though in a less degree, to metals exposed to ordinary atmospheric conditions.

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The Last Roman Pavement.

WE have received a photograph of the piece of Roman pavement discovered at Dorchester two or three weeks ago, in excavating the ground for the new Devon and Cornwall Bank. It is a very simple affair, divided into spaces by parallel bands with an ordinary form of guilloche ornament between them; an octagon centre panel with a circular centre. The tesseræ, we understand, are of five colours—red, blue, yellow, grey, and white. The finding of this piece so soon after the other and more elaborate pavement discovered two months previously on the Victoria Park estate, is however calculated to excite a good deal of interest and curiosity as to what further Roman remains may exist under the soil in and around Dorchester, only waiting to be unearthed by the spade. The pavement just discovered, which is the legal property of the banking firm in whose land it was found, has been very properly handed over to the County Museum.

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The Bushell Brasses, Preston.

AFTER being lost for upwards of half a century, the Brass of Seath Bushell (1623), together with the inscription belonging to it, is about to be replaced in the church of St. John the Evangelist, Preston. After several vicissitudes, the portions have at length come into the hands of Mr. Harrington Myres, architect, and Mr. Holland, of Preston, who have announced their intention of restoring them to their ancient resting place. As regards the brasses, they are evidently the work of some local artist; the figure of Bushell is dressed in what would appear to be an alderman's gown (with a deep hood attached), the hair, beard, and moustache being denoted by "dots," giving a "cropped" appearance. The hands are turned upwards and outwards from under the gown; the cuff of a close-fitting garment is to be seen at the wrists. The feet, which are ill-drawn, appear at the bottom of the dress. At the back of the head the plate appears to be plain, whilst the portion at the sides of the figure shows slight signs of hatching on either side. The plate is slightly damaged to the left of the figure. The inscription is in printed character, and the text is slightly different from that usually in vogue at the period. It announces certain legacies to Bushell's "kinesfoolkes and godchildren," also "20*l.* to the pave of his tome."

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No. 17, Fleet-street: "Nando's."

THE Corporation of London have agreed to adopt a recommendation made by their City Lands Committee for co-operation with the London County Council in preserving the old house, and to contribute 2,500*l.* towards the purchase of the freehold, which belongs, we are informed, to Clare College, Cambridge. The contribution is voted upon the condition that the building be not allowed to hang over the public footpath, but be set back to the general line of the improvement of Fleet-street (south side), and that the first-floor front room, wherein are panelling and a highly-decorated ceiling, be preserved in its present state for the public benefit. The house,* *temp.* James I., formed the Council Chamber of Henry Prince of Wales and Duke of Cornwall, whose plumes, coronet, and motto, between the letters "P" and "H," appear in the centre of the ornamentation of the ceiling. The later office of the Duchy of Cornwall, established at Somerset House in 1776, in pursuance of an Act passed in the previous year, was subsequently taken for purposes of the Inland Revenue Department. New offices were accordingly erected—after Sir James Pennethorne's designs—opposite Buckingham Gate, in 1854-5. The question of acquiring the property in Fleet-street for about 26,500*l.* is under consideration by the London County Council.

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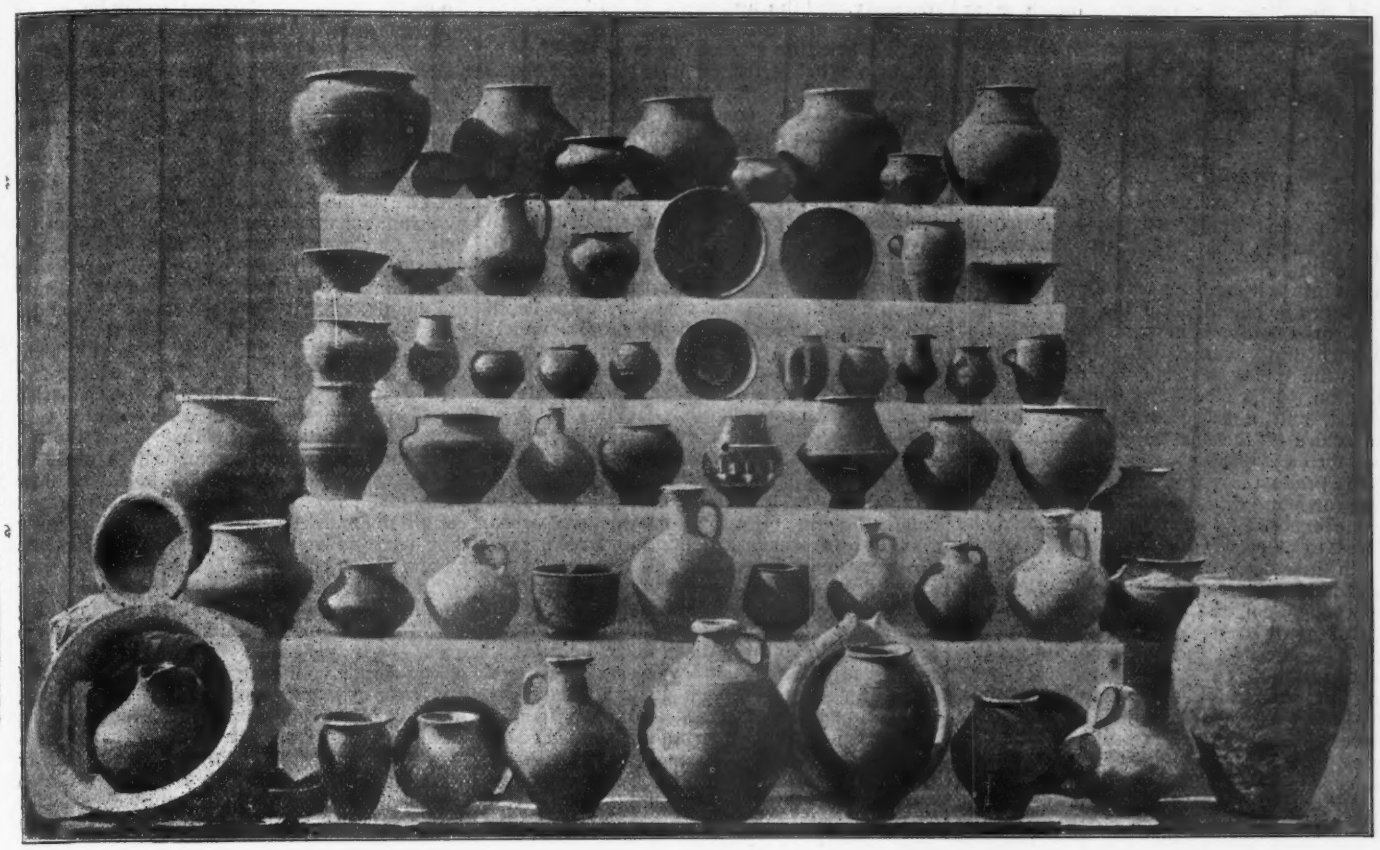
Royal Academy Lectures.

THE programme of the Royal Academy lectures includes six lectures to be delivered by Professor Aitchison, commencing on January 29, on "Progress in Architecture." After the series of historical lectures which Professor Aitchison has delivered there, the

* For a further description see our "Note" December 31, 1898.



*Pottery found at Silchester during Last Year's Explorations.*

*Dyer's Hearth, found at Silchester.*

application of them, as we may take it to be, to a consideration of the future progress of architecture will come in very suitably, and it will be interesting to hear what suggestions he has to make for that "advancement of architecture" of which he has long been an eloquent advocate. The lectures on painting, commencing on January 8, will be given by Professor Herkomer—one on "England Loveable and Paintable," two on "Portrait Painting," two on "Enamel Painting," and one on "Sight and Seeing." Dr. Murray gives six lectures on Greek sculpture, commencing on February 19, treating of "Archaic Pediment Sculptures," the "Pediments of Ægina," the two Pediments of Olympia, and the two Pediments of the Parthenon. The remaining lectures are technical ones; one course on Chemistry by Professor Church, and two on Anatomy by Dr. Anderson.

## SILCHESTER.

THE "finds" of nine years at Silchester (three of the present season will follow) are now deposited in Reading Museum, and constitute a collection which, of its kind, is incomparably finer and more comprehensive than any in the country—the kind being that representative of an industrial, a commercial, and a residential community. Amongst a large and various collection of objects, the architectural remains are of imperial importance. The pottery is of every variety of type and in endless diversity of form; glass is there in considerable quantities, and bronze and iron ornaments and implements are well represented. Coins have been found in countless numbers.

A mere schedule of the miscellaneous antiquities would exceed the limits proper for a short notice, but especial reference must be made to a force pump, the only specimen of a Roman pump ever found in Britain; and a carpenter's plane, likewise the only tool of its kind this country has yielded; a marvellous hoard of iron tools numbering nearly sixty objects; a glass bowl; a beautiful specimen of pillar-moulding, and the only complete example of its kind found in this country; several very elaborate tesselated pavements, one of them the earliest yet found in Britain, the date being about A.D. 80. The foundations of over forty houses have now been uncovered; the basilica and forum of the city; a Romano-Christian church, the oldest church and the only Romano-Christian church yet discovered in Britain, and one of the oldest relics of Christianity in Europe; three Pagan temples, and many industrial establishments.

The present season has been especially prolific of pottery, over eighty vases and bowls having been recovered since last May, many of them absolutely perfect. One small vase found in fragments, but now restored, bears the inscription "VITAM TIBI," and three Samian-ware vases, found in an old rubbish pit over which a house had been built, date from the first century.

The first illustration represents a group of vases and bowls, a selection of those found during the present season just closed.

Among the interesting discoveries of the present season was a Roman well, similar to many found in previous years, but with the rectangular oak framing at the bottom of greater depth than any hitherto found. This framing measures 13 ft. in height from the bottom of the well, and the width across is 2 ft. 6 in., the total depth being 27 ft.

The other illustration we give shows the remains of a dyer's hearth, of which many have been found; but that found this season and here represented is in a better state of preservation than any other.

We are indebted for the illustrations to Mr. Frederick Davis, F.S.A., a member of the Executive Committee of the Silchester Excavation Fund.

## EXPANDED METAL.*

EXPANDED metal is really the rolled metal plates cut and drawn out without any waste of material by very complicated machinery, invented by an ingenious American, Mr. Golding by name. In its infancy, with imperfected machinery, the material was only of light quality, cut loosely and roughly into meshes, which rendered it an untidy substitute for wire netting, and this was so rough that no one would think of putting it anywhere except out of sight. My first recollection of seeing it used in building construction was as a casing to hold up the concrete filling around steel girders, and as a means of both protecting them from the ravages of fire, which so soon expands and twists iron and steel into such fantastic forms and shapes, and as a substitute for what we call wood "cradling" employed to make a rectangular beam or circular shaft of an H-shaped joist, so that it could be treated in an ornamental way, characteristic of the interior of the building.

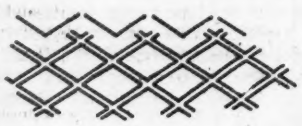
*Expanded metal* is cut out of plates of brass, copper, or steel, the machine being formed of cutting teeth of this shape, which first take a

strip off the edge of the plate and expand it down ways from the flat table, thus. The knives

then move laterally and cut the opposite side of the diamond in this wise off the next edge of the plate, each necessary movement to and fro laterally of the machine cutting half a diamond,

* A paper by Mr. J. P. Allen, P.A.S.I., of Newcastle; read at a general meeting of the Northern Architectural Association, November 29, 1899.

until there only remains the tightly fixed edge of the plate, the resulting mesh work



being from two to twelve times more than the width of the original plate, which is about 8 ft. long. If the sheet is to be used for concrete it needs no further treatment, as rust does not injure it for the purpose ; but for lathing, where the chemicals of the plaster might do it harm, it is dipped in a pan of special paint of a varnishing nature, which seems to fix itself on the metal and render it proof against oxidisation. Mild steel only, of the toughest, strongest, and finest quality, is used in the manufacture of the sheets, as a brittle metal is soon torn and of no use.

As the product improved, it came into use for lathing for plastering, and then the perfected machine enabled its uses to be extended, its qualities to be vastly improved upon, and its strength increased, for the earlier materials never added strength to our work. Now we have a clean-cut, and, I might also say, neat article of great strength and rigidity, which is now of considerable, and will be of yet greater benefit to architects and engineers. It is made of any number of meshes of a diamond pattern from ¼ in. to 6 in. across, being suitable for plasterers' lathing and every other similar kind of work, giving greatly increased strength for whatever purpose used, in addition to which it is vermin-proof and fireproof in a remarkable degree, because it is in such small parts that heat has practically no effect on it in twisting it about. In addition to which there is absolutely no difficulty in embedding or enveloping it in any plastic material, so that it can now be used with advantage for floors, partitions, ceilings, roofs, columns, and even outer walls of buildings. I have even seen it employed in making telegraph and signal poles of considerable length, besides which it is excellent for hurdles, fencing, guards to windows, open screens, and for many other purposes where hitherto we have used wire work, which is so loose and mobile. It is also employed, on account of its rigidity, as a frame work for sky signs, guards to machinery (I have seen it used between tram wheels to prevent anything from getting under a car), and it is being used as a core for lintels, concrete slabs over ducts, and for paving and making railway sleepers, while many of our eminent engineers constantly use it as a binder to concrete walls of reservoirs and the like, Mr. Mansergh having used a great quantity at the Birmingham Waterworks, and it is to my knowledge specified by that gentleman for the North Shields reservoirs, where a considerable quantity is required.

Leaving its general uses, I will now give you a few of its salient points with regard to its use as a building material. For floors and roofs it increases the strength almost tenfold, as has been proved by our leading engineers, Messrs. Fowler, Baker, and Mansergh, who have subjected it to severe tests, to say nothing of our own local experiments, with which I intend dealing later on.

In floor construction it is used to give us that resistance to tension which concrete of whatever kind lacks ; it is placed at the bottom of the floor, being laid immediately on the top of the centring and punned on to it, care being exercised that the mixture is rammed round the meshes so that they may be completely enveloped. The 3-in. mesh is the size mostly used, with strands ¼ in. and metal ⅛ in. or $\frac{3}{16}$ in., according to the strength required. The sheets are usually 4 ft. by 8 ft., and where a joint occurs a lap of at least 6 in. is necessary, which should be specially enveloped by the concrete and its matrix. The concrete should be well mixed and made out of best Portland cement weighing not less than 112 lbs. per striked bushel, which is a slow-setting cement with great ultimate strength. The cement should not be fresh, and should be so finely ground that 95 per cent. can pass a 75 sieve—that is, 5,625 meshes per square inch—and it should be capable of withstanding a tensile strain of 450 lbs. per square inch after seven days' immersion in water, increasing to 20 lbs. per week until it reaches 510 lbs. in twenty-eight days. The sand to form the matrix—which should be of the consistency of thick cream—should be sharp and clean, being washed if necessary, and the aggregate should consist of three parts of clean smithy clinker ashes, or crushed brick or stone to pass a 1¼-in. ring, the whole being turned over at least twice when dry, and the water then added by means of a rose. Close centring should always be used. I have heard of floors being laid without it, but the proceeding is bad and the result highly unsatisfactory, as the matrix is apt to percolate through. The centring can generally be struck in ten days. A floor constructed with expanded metal need not have its joists closer than 42 in. inclusive, centre to centre, and it can be laid to a minimum thickness of 3 in., the usual depth being 4 in., which it will be readily understood increases the effective height of a room or reduces the necessary height of the whole building. This is of considerable value in buildings with many floors. Besides this, 4 in. only of concrete is a saving in weight of some value when concentrated. Floors for warehouses and similar buildings are constructed on the lines just laid down, but where the span entails the use of joists of considerable depth, another form of construction is adopted. We all know it is inadvisable on account of the sagging to employ girders of greater length than twenty-five times their depth. (Personally, I do not believe in exceeding twenty times their depth.) In these cases it has been found a great advantage to employ the patent channel arch floor between main girders, which are spaced about 20 ft. apart, and from them a steel channel is sprung from the main girder's lower flanges, these channels being 5 in. by 3 in. or larger, and spaced 3 ft. 6 in. to 4 ft. 6 in. apart, and rising 1 in. per foot of span. The channel itself and the spandrel of the arch formed by its curve is filled with concrete, and the metal and floor laid thereon in the usual way, as previously explained. This channel arched floor is very serviceable, and is coming into general use, having already been extensively used, and I believe acres of it are employed in dock warehouse floors, including those of the Manchester Ship Canal Company, where I am told 17½ acres alone have been put down only just lately. Such a floor, with only 4 in. or 5 in. thickness of concrete, can be guaranteed to carry safely 10 cwt. per foot superficial—a strength not easily attainable under ordinary circumstances without going to very great expense. Of course, this channel arch floor should not be employed from wall to wall without tension bolts to resist the thrust, if the walls do not give a sufficient haunch in themselves. The top of the floor can be levelled off in the usual way for wood blocks, flooring, or asphalt, or it can be finished outright with a smooth surface—it can also be finished with an extra inch or so mixed with coke breeze, so that the mixture is soft enough to drive nails in and to attach an ordinary or thicker wood floor, while gas or other pipes can also be imbedded in the top screed. Well-ways in these floors can readily be constructed, a sheet of small mesh being imbedded between the ordinary mesh and the under-side of the joist, and bent round the joist and over the top, the space being filled with concrete and finished off like any ordinary facia or apron. This is both neat and proof against fire, as the steel or iron is enveloped. In other cases which require a flat ceiling underneath, an independent ceiling is suspended by attaching the metal lathing with clips to bar-hangers, 12 in. or 14 in. apart, which in their turn are secured to the bottom flange of the joists as the model will explain. This, as it were, double floor can have the space utilised as an air space, which renders the floor doubly fireproof (if such were necessary), or pipes, &c., can be run therein, so that we have an eminently fireproof construction, which is also vermin-proof and sound-proof to a high degree. This latter is a consideration of great value, as most fire-proof floors are anything but sound-proof, unless we raise the building or lower the effective height of the roof by having a counter ceiling, which necessarily means further expense. Such a double floor as has been pictured, with expanded metal for a room 14 ft. wide, need not take up more than 14 in., and its advantages would be considerable with little extra expense. If the space for a double floor and ceiling—and it is only a matter of 4 in.—be too limited, then the expanded metal slabs can be rested on the lower flange of the girders, care being taken for economy's sake that the girders are placed equidistant to suit the dead lengths of the metal sheets, but they can easily be cut to required sizes. If the girders are deep the space above the slab is firred out and the floor-boards attached to it. The weight of the cement slab and metal varies from 20 lbs. to 40 lbs. super, and the ceiling is about 10 lbs. more.

*Partitions and Walls.*—Partitions, like ceilings, may—though it is inadvisable, as it does not give us the real benefit we are entitled to by using expanded metal—be constructed by fixing the expanded metal lathing to the actual woodwork, which then becomes covered with a sheet capable of resisting fire, but I am afraid the woodwork between two such sheets under great heat would soon become reduced to charcoal—in fact, such a case occurs to me, in which an expanded metal concrete floor and ceiling were placed experimentally, each side wood in floor joists, and then subjected to very severe fire from underneath. When the fire had been put out and an inspection could be made, through the inspection holes, the floor joists could not be found, while the floor and ceiling maintained their position, but obviously they were of no effective use, their supports having gone entirely. The best way to construct these partitions is either by the single or double process, in both of which cases nothing but iron, expanded metal, and plaster are used.

The single wall is made by fixing rods of ¼-in. iron from floor to ceiling at 12 in. centres, the ends of the rod (cut to exact length) being twisted to form an eye through which it is screwed to floor and ceiling and made taut, or with iron joists the loop is placed over a screwed bolt which is attached by clips to the iron joist, and the rod is tightened by a nut which screws on to the thread of the bolt. The lathing is then fixed by wire to the iron rods or studs, care being exercised to break the joints, as a plasterer should bond his ordinary fir lath. The first coat of plaster is then applied and well pressed to form the key through the meshes. My impressions on seeing this stage of the work for the first time were bad, as the lathing could be pressed and moved backwards and forwards like a strained sheet. I afterwards ascertained that it is advisable to stay the lathing from behind by a horizontal batten, while the first coat is being applied, and allowed to set. When this becomes dry and rigid the floating coat is applied on each side and then the setting coat in the ordinary way. In a very short time we have a solid partition 1½ in. to 2 in. thick with level and straight surfaces, each side quite as good as is procurable by the ordinary methods. In my opinion it is not advisable to use ordinary plaster, *i.e.*, haired-lime mortar, nor, on the other hand, is it necessary to employ special plaster. It has been proved to my mind that excellent results can be obtained by using gauged plaster—with about a third of plaster of Paris or Portland cement; the former dries quicker and the work can be completed more expeditiously, but the Portland cement gives greater ultimate strength, makes a more satisfactory job, and is perhaps a little less costly too.

Double Partitions are formed in skeleton by a pair of small steel angle irons stayed together by strips rivetted on to keep them the desired distance apart ; the stays, or what in a wooden partition we would call the stemming, are arranged according to height, and at each end an angle iron is used, the bottom and top side of which is secured to the floor and ceiling joists. The framework is then covered over with the E. metal lathing and plastered as before. In external work the outside is always in cement and more or less ornamentally treated. I am told that houses of expanded metal and cement external walls are very much in vogue in America, and I have had sent me photographs of very large houses practically built wholly of these materials. The double partition used as an external wall should be secured by occasional angle iron feet and holding down bolts imbedded in concrete, with the necessary stanchions and girders as required to support floors and roof; and there is no reason why such a system should not be extensively used in this country. By its adoption we should have light and strong buildings with fireproof qualities in an eminent degree, to say nothing of the sound and vermin proof advantages. We could have even deaf party-walls, as there is nothing in this system to conduct sound, and a partition of

the double construction would be a great boon for this reason alone, while the single partition quite deadens any ordinary noise.

As to the fixing of joinery, doors, and windows, these are treated by building in the solid frames or windows, and fixing the lathing securely to them before plastering. This is done very easily and effectively, and if they are not secure and rigid when first put in, in a very short time they become quite firm, as soon as the plaster or cement work is anything like set. I find it is not even necessary to run door jambs up to the ceiling, as I once thought was the case. The door can be banged about without any movement in the partition being apparent, and as this refers to a single partition there can be no doubt as to the double one. Skirtings or rails can be fixed to soldiers or grounds of wedge-shaped form embedded in the plaster in the floating coat, when their adjusting comes in very handy in aiding or saving the plasterers' grounding for true surfaces. In double partitions it would be advantageous to fill in the bottom of the spacing with breeze concrete, which would give us an attachment for the woodwork as well as form a stop to any possibility—remote as it may really be—of vermin being able to get into the partition, a result which very often befalls wooden partitions.

In short, external and internal walls can be built entirely of these metal and plaster productions, as well as floors of any strength. In addition to which, the roof, whether sloping or flat, is very much within the range of the possibilities of expanded metal; it could be lathed and slated or asphalted, so that we can have a damp-proof, fire-proof, sound-proof, and vermin-proof building, giving much greater capacity and yet occupying the same space both of area and height, and costing no more. The materials lend themselves to all imaginable kinds of treatment architecturally, so that you have not to consider what your materials will do or not do, or be done to, as to injury.

*Cost.*—In considering this portion of my subject, I wish to state that the prices set down to each item are what may be considered fair average prices under normal conditions, in a period when no fancy prices are ruling. I propose to compare a floor for a dwelling-room 16 ft. by 18 ft., to carry 1½ cwts. per ft. super, one for a public room to carry 2 cwts. 30 ft. by 40 ft., and one for a warehouse 80 ft. by 100 ft., to carry 5 cwts. per ft. super. The dwelling-room floor consists of 1¼ in. flooring, 11 in. by 3 in. joists, herring-bone stemming, and wall plates, with lath and plaster ceiling underneath about 12½ in. total thickness, and will cost 15*l.* 17s. 4d. To floor over with concrete and iron joists 18 in. apart, with wood (not block) floor and plastered ceiling, will come to 33*l.* 11s. 10d. A similar floor with expanded metal, which allows us to spread out the joists, as they are always too strong in the last kind of floor, because deflection has to be considered, would cost 28*l.* 2s. 4d. The total thickness of each of these floors is 12 in., nearly equalling, for all practical purposes, the wood floor. Neither of these are, however, sound proof, and to make your rooms anything like quiet, you would have to put in a counter ceiling, which in each case would cost an additional 3*l.*, not to mention the value of the 6 in. of additional height put on the building. This item might entail anything, but nothing less than 35s. for this one room only. With the wood-joisted floor, the commonest deafening—anything but sound proof—would cost 4*l.*, while you would have a highly inflammable floor, yet a generally common one.

The best floor made by the use of expanded metal would be 15 in. thick, the 3 in. in the first place entailing an extra of 17s. 6d. on the room under notice; but we should have a sound and fire proof floor each of the highest class, for there would be a space between floor and ceiling, and everybody knows that "space" is a non-conductor of sound, as well as of damp. A floor of steel joists, expanded metal, concrete floor, and wood flooring, with expanded metal lathing and gauged plaster ceiling, would cost 25*l.* 15s. The public hall floor, 30 ft. by 40 ft., would, no doubt, have two columns and a main girder running lengthwise, and as this would be equally necessary for all kinds of floors, just as the main walls would be, it may be considered as outside our subject.

The Expanded Metal Company say the reduced weight of concrete required under their system saves in the thickness of the walls and supports, but I personally do not think this worth considering. Who would wish anybody to sail so close to destruction of their building? and unless a large series of floors came on to one girder or column I would never entertain the true value of the saving.

A wooden floor would be similar to the last, but in two bays, and would mean an expenditure of 82*l.* 11s. 9d., which includes deafening, against which a double floor of expanded metal would mean an expenditure of 122*l.* 12s. 10d., but it must be remembered that this would supply every precaution against sound and fire. A 10 in. concrete floor with iron joists, floor, and ceiling would cost 162*l.* 12s., and this is what we have used hitherto without getting any sound-proof qualities, to secure which a further sum of 13*l.* 6s. would have to be expended. A similar floor to the last, but having the joists extended from centre to centre, and adding metal between, would run to 136*l.* 19s. 10d. without counter ceiling, which, in addition to the 13*l.*, might cost anything over 3*l.* 15s. for raised walls.

The warehouse floor, to carry 5 cwts. per foot super over an area of 80 ft. by 100 ft., would be impossible with wood, unless you used 6 in. by 12 in. beams at 24 in. centres and 3 in. flooring, which would cost 697*l.*; if we employed concrete and iron joists at 18 in. centres it would cost 727*l.* 17s., whereas by employing the patent channel floor it would only cost 587*l.* 12s.

*Partitions.*—Partitions can be formed by securing the lathing to the rods, and plastering both sides at a cost of 6s. 4d. per yard superficial, as against a wooden plastered both sides stoothing at 4s. 2d. per yard—the thickness of the latter being 5½ in. as compared with 1½ in. with the expanded metal—a saving of space not to be despised where there are a quantity of partitions. A double partition which is sound proof can be constructed for 8s. 4d. per yard superficial, and the thickness need not be more than 4 in. The price of both these partitions includes for the plastering being gauged.

*Tests.*—The object of the Newcastle tests was to ascertain the relative strength of concrete slabs of equal monetary value for floors with and without expanded metal, and I think the result was achieved, though the ultimate strength of each kind was not altogether as we should have wished it, because the concrete as a whole was not of the best owing to the quality of the cement and the fierceness of the sun, to which it was so unusually exposed. The approximate value of the expanded metal was added in concrete to the thickness of the slab without metal, so that with metal it was 5 in. thick and without metal 8 in. thick. It was proved that the increase of strength varied from seven to twenty times, although only two sets could thus be compared. Two others could not be broken, as it was dangerous to pile up the loading metal higher, and we had in consequence to forego attaining our end. Each slab with and without metal was made out of the same gauging of concrete, and all slabs were tested with their ends or bearings loose, whereas in actual practice they would have been what we call fixed. Sir John Fowler and Sir Benjamin Baker tested this material several times, the result of their experiments being that they reported as follows:—"That the use of *expanded metal* in the case of a 3 ft. 6 in. span, *increases the strength* of a flat concrete slab from *six to eight times* the strength for carrying a uniform load than it would have if made without metal, and in the case of a *6 ft. 6 in.* span, the *strength is increased to ten and eleven times.*" Further, "as regards strength, the slabs made without expanded metal did not approach those made with the metal, and that even with a *neat cement slab* the strength was *much inferior.*" According to this report, the use of a neat cement slab (which cost as much as that in which expanded metal was employed) only showed an augmentation of from twice to three times the strength, as compared with the three to one mixture, whereas *the introduction of expanded metal enhanced the strength from eight to eleven fold.*

The mean results obtained by these important experiments were as follows:—With a clear span of 3 ft. 6 in., the slab without expanded metal broke at the weight of 2·57 cwts. per foot super uniformly loaded, while with expanded metal of $\frac{7}{3\cdot2}$ in. by $\frac{3}{3\cdot2}$ in. strand, the breaking weight was 15·86 cwts. per foot super, and with the $\frac{7}{3\cdot2}$ in. by $\frac{5}{3\cdot2}$ in. expanded metal was 19·28 cwts. per foot super, and with a clear span of 6 ft. 6 in., the slab without expanded metal broke at the weight of ·46 cwt. per foot super, while with expanded metal of $\frac{7}{3\cdot2}$ in. by $\frac{3}{3\cdot2}$ in. the breaking weight was 4·61 cwts. per foot super, and with the $\frac{7}{3\cdot2}$ in. by $\frac{5}{3\cdot2}$ in. expanded metal was 5·07 cwts. per foot super. The slabs were all 3 in. thick, composed of one of cement, one sand, and two parts of Thames ballast, which is not the best aggregate for obtaining a maximum tensile or transverse resistance. The time allowed for setting before testing was on an average sixty-three days. Experience demonstrated that metal of 3 in. mesh ¼ in. by ⅛ in. strands gave the best results with slabs of 3 in. thickness. And Mr. Mansergh's tests resulted as follows:—With a clear span of 6 ft. 9 in., the slab without expanded metal broke at the weight of 4·11 cwts. per foot uniformly loaded, while with expanded metal 3 in. mesh, ¼ in. by $\frac{2\cdot1}{16}$ in. strands. the breaking weight was 19·75 per foot super. The concrete was in each case mixed in the proportion of four of broken rock (¾ in. gauge) and sand to one of Portland cement, and the age of the slabs was eighty-eight to eighty-nine days.

## PHOTOGRAPHY FOR ARCHITECTS.

IT is somewhat remarkable, when the great spread of the amateur practice of photography among all classes of the community in recent years is considered, that so few architects have taken up its study and use as an aid to and a systematic part of their work. Some few certainly possess cameras, and use them with more or less frequency and success, but the number who do so seriously and constantly, and with definite aim and purpose, is not large.

To the architectural student the uses of photography are many and important. In his study of the history of the art, as shown in the works of past generations, he will find photographs taken by himself, not only of immediate service for the acquisition of knowledge, but also of value for future reference, as aids to memory and records of precedent. For these purposes they will be of most utility if he be careful in the preservation and classification of his results, which may be done either in portfolios or in the well-known Zaehnsdorf albums with their removable and interchangeable leaves, which permit of rearrangements and additions being made at any time, and allow the collection to be sub-divided as it grows in size, and as photographs of similar character become numerous enough to demand a section or volume to themselves. The principles on which such classification and sub-division may be made will naturally vary according to the taste of the student and his opportunities for photographic work; but, at first, in the department of historical study, it is a good plan to commence with divisions for each of the main periods, and in the department of practical work to have sections for materials, construction, processes of manufacture, &c. The advantages of the student taking his own photographs, rather than buying the regulation publication views of the dealer, are twofold. First, he gets the exact thing he requires, taking his pictures from such points of sight and under such conditions of illumination as will best bring out the features he most particularly desires record of. Secondly, having the negative, he can produce from it, at small cost, as many prints as he may require, which is very convenient when it is desirable that a particular subject should appear in more than one department of his collection, or when he may be engaged in the very profitable occupation of "grangerising" any of his text-books. Many other uses of photography to the architectural student will also readily suggest themselves. For instance, nothing is more important to the architect than a knowledge of the effect of light and shade on the details and masses of buildings, and in this matter much may be learned by taking a series of photographs of the same edifice at different times of the day, from different points of the compass, and under different effects of lighting. The grouping of masses may be also studied in the same way. Photography will also be useful to the student in enabling him to obtain copies of drawings, prints, and illustrations of architecture in cases when by reason of their rarity or cost he may be unable to possess himself of the originals. In the instruction of students in large numbers photographs in the form of slides for the optical lantern are also of much service, and, given the possession of the original negatives, their preparation is not a matter of much difficulty. Most lecturers,

*"Lynch House," Sevenoaks. Messrs. Niven & Wigglesworth, Architects.*

and scientific societies, now make use of this optical projection of photographs, but it has, I think, hardly received the attention it deserves from those connected with architecture.

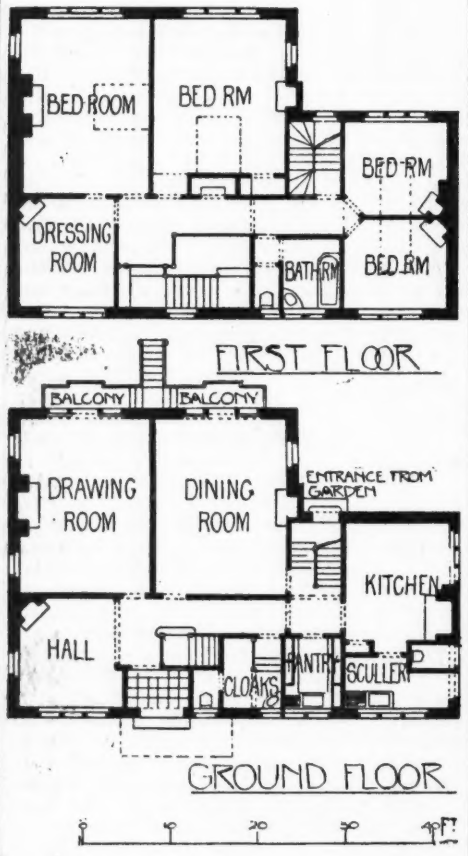
Another, and a great, advantage of photography to the architectural student is the fact that it enables him to obtain a very much larger amount of record of things seen and studied than is possible by any other method, graphic or literary, in a given space of time, the camera fixing for him in seconds images that would take hours to put down in any other way.

To the professional and practising architect photography is, if anything, of even more value than to the student, for by it he has the power of recording, at all stages, the progress of his works in course of construction, and their final effect when completed and ready to leave his hands. Most architects, who have been in practice for any length of time, would probably value a complete collection of photographs of their works very much indeed; and such a collection, especially if accompanied by reduced photographs of the plans, would also be very useful for showing to clients, who rarely understand geometrical drawings by themselves, and seldom gather from them a correct idea of the buildings they represent. It is also often of great convenience to be able to produce quickly and in quantity reduced copies of plans, elevations, and perspectives for purposes of publication or transmission to a distance, and this also can be done by the architect who is his own photographer without the drawings leaving the office, and without the errors which too often occur when any chance professional not familiar with this kind of work is called in.

When rebuilding has to be done photography is often also of use, not only for preserving a record of the original edifice and its surroundings, but also for providing evidence on legal points which may arise on such matters as ancient lights, damage to adjacent property, &c. Cracks in walls may, for instance, be carefully photographed from time to time for the purpose of seeing if they extend or widen in consequence of any alterations in progress, subsidences may be detected and recorded, and other data of much value be obtained by the use of the camera.

Many other instances of the ways in which photography may be of service to the student and the practising architect might be given; but enough has, I think, been said to prove its general utility, and the user of it in one direction will very quickly find its value in others, and take more and more interest in it as he becomes proficient in its various branches.

D. B., F.R.P.S.




Plans.

## "LYNCH HOUSE," SEVENOAKS.

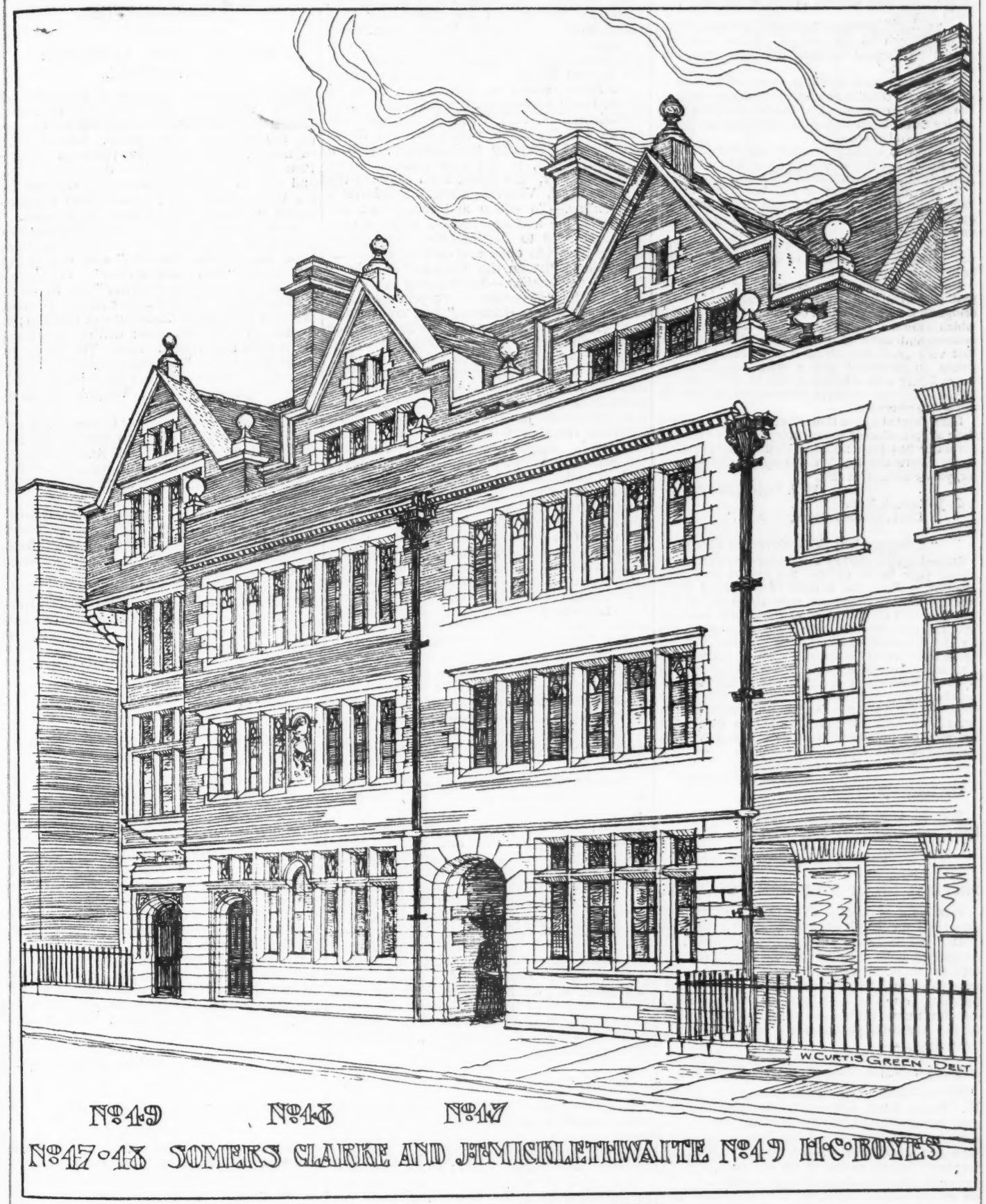
THE illustration is of a house recently erected at Sevenoaks. The walls are of red brick, the roof tiled.

The plans of ground and first floors are annexed; the basement contains servants' hall, larder, cellars, and heating chamber.

The architects are Messrs. Niven & Wigglesworth, and the drawing was at the last Exhibition of the Royal Academy.

## *ARCHITECTURAL SOCIETIES.*

GLASGOW ARCHITECTURAL CRAFTSMEN SOCIETY.—The usual meeting of this Society was held at the rooms, 204, George-street, on the 22nd inst., Mr. W. H. Baxter presiding over a large attendance. The paper was by Mr. Isaac Low, on "Water-closets and their Connexions." In his opening remarks he said the subject was, more or less, a most important matter for consideration by architects and craftsmen. He deprecated the idea that any hole or corner is good enough for a water-closet; it should have, he said, three of its walls to the outside, although the cost was, of course, always prohibitive, to a great extent, to the proper sanitation of any building. He traced the evolution of the water-closet from the earliest times. They were in use considerably earlier than most persons would imagine—the most ancient examples being mostly in the form of a marble-basin with the ordinary draw-valve. The idea was good; only, the marble being very absorbent, rendered such an article unsatisfactory. Thereafter he sketched the evolution of the pan closet, which was similar in idea to that just mentioned; and next he took up the Hopper closet—much used in Edinburgh—and which was really the prototype of the present "wash-down" closet—this latter being first brought out in Glasgow. He showed the various points in the S, P, and Q traps to this latest form, together with the nature of the best joints between the porcelain and the soil-pipe. Internal and exposed plumbers' work was also commented on, the lecturer being of the opinion that the former was quite proper if the tradesman did his work




*Sketches of London Street Architecture.—XXXV.*

correctly. An interesting discussion followed, many points in actual practice being brought up, all of which Mr. Low dealt with.

## LONDON STREET ARCHITECTURE.—No. XXXV.

THE houses, Nos. 47, 48, and 49, Chancery-lane, have been built at various times on Sir Hickman Bacon's estate, as the leases of the old houses fell in.

The first two mentioned are from the designs of Messrs. Somers Clarke and Micklethwaite. No. 49 was built by Mr. Henry Cowell Boyes, who accommodated his design to harmonise with the other two. All three houses are built in red brick with stone dressings.

## VAUXHALL BRIDGE.

THE following correspondence appears in the last number of the *Journal* of the Institute of Architects :—

"November 8, 1899.

SIR,—The Council of the Royal Institute of British Architects, having before them the Report of their delegates who were so courteously afforded the opportunity of examining the drawings and models for the proposed new bridge at Vauxhall, desire most respectfully to submit the following points of criticism and suggestion for the consideration of the London County Council :—

1. The main piers should be increased in width if this can be arranged with the Thames Conservancy.

2. The great projection of the cutwater in front of the pier seems unnecessary in so wide a bridge. A flat band with slight projection would serve its purpose better than the large projecting capping. The form of the weathering upon the cutwater is unsatisfactory.

3. The semicircular projection on the piers should be treated as part of the pier, and not as an attached column. (At present the stopping of the neckings to cap and base against the rustication is very awkward merely as a matter of detail.)

4. The projecting quoins at either side of the pier upon the flat spandrel of the arch have no significance and no architectural value and should be omitted.

It is a question whether it would not be a distinct improvement to the pier to omit the semicircular column upon the face of the pier and the detached column it carries altogether, and to treat the pier as a square one to the same design as the flat portion now indicated, but with greater projection.

This would obviate the awkwardness of the raking lines of the caps of the circular columns

which has been ignored in the model and ¼-in. scale drawing.

5. The arch, although increased in depth, is still painfully thin in appearance. Some expedient should be adopted whereby the voussoirs can be deepened.

6. Having regard to the weakness of the arch as designed, we think it inexpedient to emphasise it by the heavy rustication. The treatment of Waterloo Bridge might be studied with advantage as regards both arch and spandrel.

7. There is nothing to show how the granite is returned under the soffit. The voussoirs should be properly bonded as quoins on the soffit.

8. The alternate narrow and broad dies in the balustrade have a restless and unmonumental appearance. They would be improved by being of one size throughout.

It is a matter of question if a solid parapet would not assist the appearance of solidity which the bridge now appears to lack.

Generally speaking, the Council are of opinion that the architectural treatment and detail of the bridge lack that distinction of style and scholarship which may be reasonably looked for in a great monumental work of the kind, and they still feel that very great advantage would accrue if competent architectural advice were sought. The Council hear with satisfaction that it is apparently intended that one coloured granite is to be used for the whole structure.

I am directed by the Council once more to express their appreciation of the courtesy by which the opportunity has been afforded them of laying their views before the London County Council.—I am, Sir, your obedient servant,

W. J. Locke, Secretary.

C. J. Stewart, Esq.,
Clerk, London County Council."

"Spring-gardens, S.W., November 25, 1899.

Sir,—I am directed by the Bridges Committee, to whom your letter of the 8th instant has been referred, to thank the Council of the Royal Institute of British Architects very sincerely for the trouble which the delegates of the Royal Institute have taken in examining the drawings and models for the proposed new bridge at Vauxhall and for the suggestions which are embodied in your letter. I am to assure you that those criticisms and suggestions will have the most careful consideration, without impairing the responsibility of the Chief Engineer for a structure which necessarily, and in accordance with every precedent, falls within the business of his department. — I am, Sir, your obedient servant,

C. J. Stewart,
Clerk of the Council."

The Secretary R.I.B.A.

See, in regard to the latter portion of this letter, our "Note" on page 601.

## PRIVATE BILLS FOR NEXT SESSION.

The sets of plans and other documents deposited for local measures to be promoted next Session amount to 421 in number, as compared with 365 last year. They relate to fifty railways, sixteen tramways, ninety-seven miscellaneous, 133 general, and 109 electric lighting, provisional orders (Board of Trade). Of the more important projects that come within our own province we may notice the following :—

### Docks, Harbours, Piers, Bridges, &c.

Bills.—*London and St. Katharine, and E. & W. India Dock Cos.*—To amalgamate the two companies, with a consolidation of the Act of 1888, which set up the Joint Committee, who now divide the profits up to 475,000*l.* net earnings in the ratios of 69 per cent. and 31 per cent. respectively, and of 50 per cent. apiece on excess above that sum ; and to remove the exemption from charges now enjoyed by owners of lighters loading or unloading in the docks, which, according to a memorandum lately issued by the committee, presses very heavily upon their resources.* *London and N. W. Railway.*—A dock, 300 yards by 500 yards, at Garston, on the Mersey. *Shoreham Harbour Trustees.*—A wet dock with a water area of 13 acres, a new West pier, and an extension, 123 yards, of the East pier. *Mersey Docks and Harbour Board.*—A river wall or embankment at Birkenhead between Tranmere Graving Dock entrance and the promenade at Rock Ferry Slip. At Maryport : To enlarge the dock area by 9 acres, with an entrance basin, 80 yards by 110 yards, and a pier or breakwater from the North Pier, 516 yards west. A transporter bridge from Mersey-road, Widnes, to Waterloo-road, Runcorn, across the Mersey and the Manchester Ship Canal, about 330 yards in length, constructed of steel-wire cables, carrying girders (70 ft. high above high-water level at spring tides), on the bottom flanges of which runs a frame upon rollers which supports a car, 60 ft. by 24 ft., to be propelled by mechanical power. *Hoylake and West Kirby U.D.C.*—A promenade (Meols Parade, 2,130 yards) between North Parade and Wallasey Embankment, with a pier, 200 yards, from North Parade. *Cowes U.D.C.*—A pier, 100 yards, from opposite the Marine Hotel, Victoria-parade. *Scarborough Corporation.*—To widen and reconstruct the Valley bridge and approaches, make a new approach road to Marine-drive from South Bay, and provide open and covered sea-water swimming-baths on the shore and elsewhere. *Margate Corporation.*—To take over the enterprise of the "Company of Proprietors of the Margate Pier and Harbour," and construct a pier, 520 yards, from near Clifton Baths ; three new marine drives and sea-walls, and a head or landing-stage, 170 yards long, in front of the jetty head. *Proprietors of Margate Pier and Harbour.*—A south pier, 468 ft. long, from the harbour slipway, Marine Parade ; to widen the Jetty and Jetty Extension on its three seaward faces, and reconstruct the Jetty's old head. *Southampton Harbour Board.*—To reconstruct and strengthen Town Quay and to widen it to 40 ft. more on the east side ; widen and extend for 80 yards from its west sea-front the part of Town Quay between the Royal Pier and Watergate Quay opposite the end of High-street ; dredge, deepen, and improve channels in Southampton Water, and erect additional warehouses on Town Quay. *Workington Railway and Docks.*—To take over the existing undertaking, "Old Harbour," from Lord Lonsdale and the Trustees of the Lonsdale estates ; to construct two piers from the seaward end of John Pier (167 yards) and North Jetty (442 yards), with a reclamation wall, and a wet dock, 224 yards by 200 yards, near Lonsdale dock. *Fishguard and Rosslare Railways and Harbour.*—A harbour at Rosslare by extending the present pier 337 yards north by west, and a reclamation embankment, 260 yards, between the foot of the cliff and the east end of the viaduct.

Provisional Orders.—By *Bexhill U. D. C.*—A promenade pier, 1,320 ft., with landing-stage, 60 yds. ;* and, by "promoters," a pier, 1,400 ft.,* both from near the coastguard station. *Bridlington Pier and Pavilion Company.*—A pier, jetty, and landing-stage, 243 yards,* from the esplanade. *Dawlish U. D. C.*—A pier with pavilion, 255 yards, from near the railway station. *Eastbourne Pier Company.*—To widen their pier on both sides, with a landing-stage at its end.* *Mr. R. F. Weld.*—A pier, 250 yards, from the sea end of Craven landing-berth, with a lighthouse at Beacon Point. *Coast Development Company.*—At Lowestoft, a pier, 250 yards, from opposite Claremont-road ; * and at Felixstowe, a pier, 1,100 yards, from the old Battery. *Pwllheli Pier Company.*—A pier, 200 yards, with T-end, 64 yards, at West End Parade.*

### Open Spaces and Recreation Grounds.

Bills.—By the Corporations of *Huntingdon.*—To acquire the commonable lands known as Views (66 acres), Mill (29 acres), and Spring (52 acres) Commons, the Baulks (15 acres), and Lammas Lands (195 acres) ; pay a perpetual annuity of 478*l.* to freemen and their widows in lieu of their rights therein, and lay out the lands as open spaces and public parks. *Bournemouth.*—The commonable lands in Bournemouth, Christ Church, and Holdenhurst parishes first enclosed under the Act 42 Geo. III., c. 43. *Cardiff.*—To acquire Leckwith Common (25 acres). *Eastbourne.*—Lands at Willingdon, known as the Decoy (82 acres), for a public park. *Salford* ; and *Walsall*—with proceeds of a sale of the Sand Bank. The *Tottenham U. D. C.* propose to convert the Lammas Lands to similar uses, and to equip the ground with swimming-baths, a museum, a space for games, and so on.

### Crematoria.

By the Corporations of Bournemouth, Cambridge, Croydon, Exeter, Hastings, Sheffield, and Walsall.

* Some new works comprise a lengthening to 480 ft., and deepening to 29 ft., of the entrance lock, E. W. India Dock.

* With pavilions, assembly and concert rooms, bazaars, baths, refreshment rooms, &c.

## Illustrations.

### BRONZE DOOR, FLORENCE CATHEDRAL.

After the completion of the façade of the Cathedral of Florence in 1887 a competition was instituted for designs for the three principal doors. Several were submitted, and ultimately those of Signor Passaglia were accepted for two of the doors, and that of Professor Guiseppe Cassioli for the third, which we produce from a photograph by Messrs. Alinari Bros., of Florence.

As will be seen, the door is divided into two panels, the subject in the centre at the right hand being "The Nativity," and that in the left hand "The Assumption." The figures represented in "The Nativity" are St. Elizabeth holding the Virgin in her arms. In front of them are Saints Zachary and Joachim ; in the background is St. Ann ; whilst above them are angels throwing flowers. The figures in "The Assumption" are the Apostles watching over the tomb of the Virgin Mary ; above there is an angel showing the Virgin's ascent to Heaven.

The subject in the corner to the left at the top is "God's First Word to Man" ; on the right (top) "The Visitation of St. Elizabeth to St. Ann" ; in the lower left corner is "The Repose in Egypt" ; and at the right "The Annunciation."

The bas-reliefs are surrounded with ornamental foliage, from which spring twelve niches, filled with the figures of Ruth, Sara, Rebecca, Judith, Rachel, St. John, St. Anthony, St. Cecilia, and an allegorical figure.

The weight of the door is upwards of six tons, of the finest bronze, and its thickness from 1½ in. to 3 in. It was cast at the artist's own studio, under his personal superintendence, and was a work of great anxiety and trouble to the young artist, being both his own designing and modelling.

The cost of the work was aboot 3,500*l.*

### PLAYFAIR MEMORIAL FOUNTAIN, ST. ANDREWS.

This fountain has recently been erected at St. Andrews, on the piece of ground immediately to the south of the club-house, and directly in front of the flagstaff. The monument takes the form of a stone pier, finished with a cornice and surmounted by a lion supporting the Playfair coat of arms within a band. Underneath is the inscription :—"In memory of Lyon Playfair, first Baron Playfair, of St. Andrews, P.C., G.C.B., F.R.S., LL.D. Born 21 May, 1818 ; Died 29 May, 1898. Erected by his children."

Beside the inscription is a panel containing the arms of the deceased surmounted by the pelican crest. Below are two basins of unpolished granite, fed by water jets emerging from the mouths of dolphins. Dog troughs are provided at the ends.

The monument was erected from the designs of Mr. R. S. Lorimer, architect, of Edinburgh.

### PRESBYTERIAN CHURCH, NOTTINGHAM.

This church has been erected in the Mansfield-road, Nottingham, from the designs of Messrs. Brewill & Baily, architects, of that city.

The exterior facing is of hammer-dressed Coxbench stone, and the window dressings, &c., are of Hollington stone. The roof is covered with green slates and a stone ridge. The interior seating and open timber roof have been stained a bronze green, and the windows are glazed with a clear light sea-green glass.

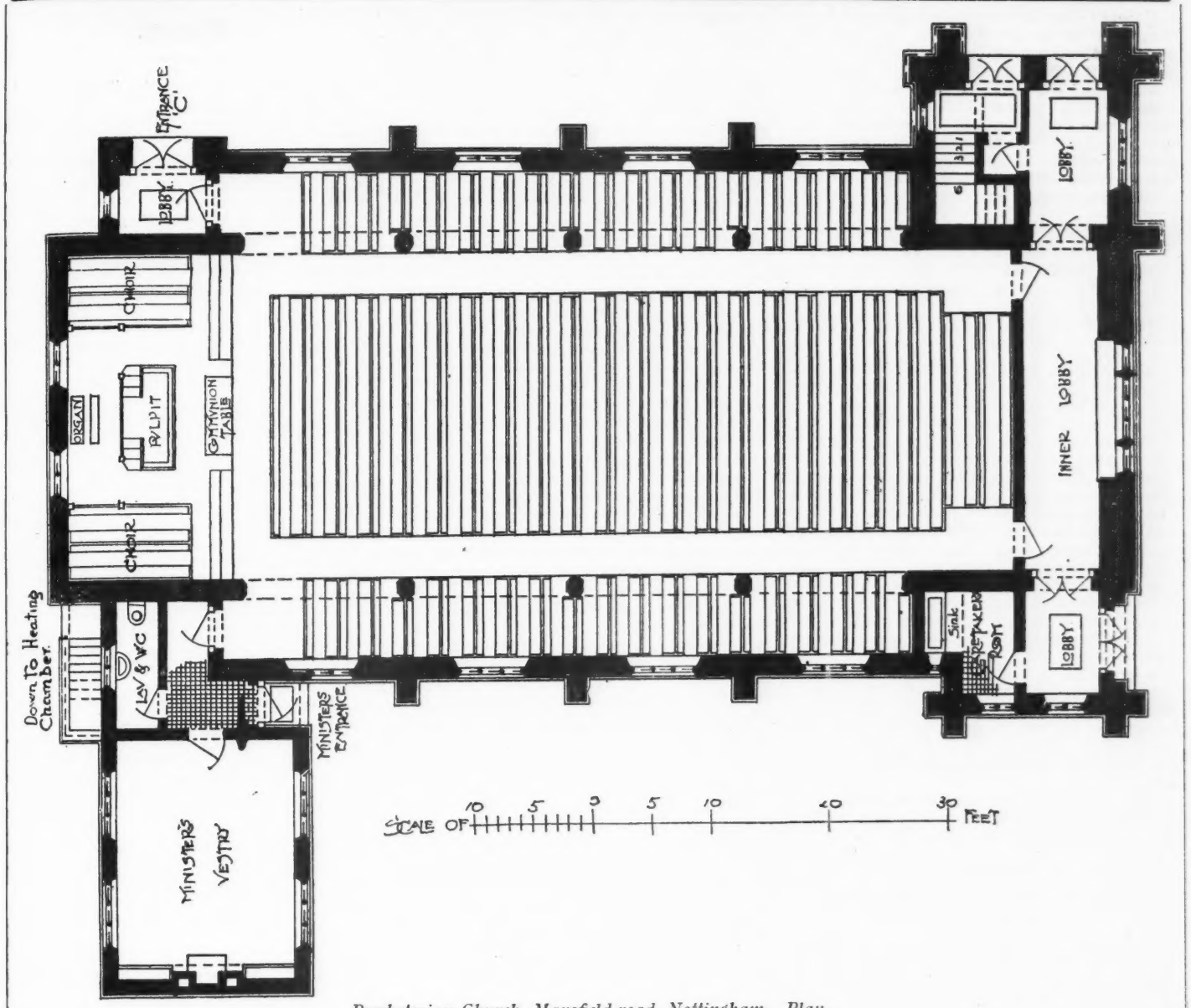
It is proposed to erect a clock with chimes in the upper portion of the tower.

The building has been fitted throughout with electric light.

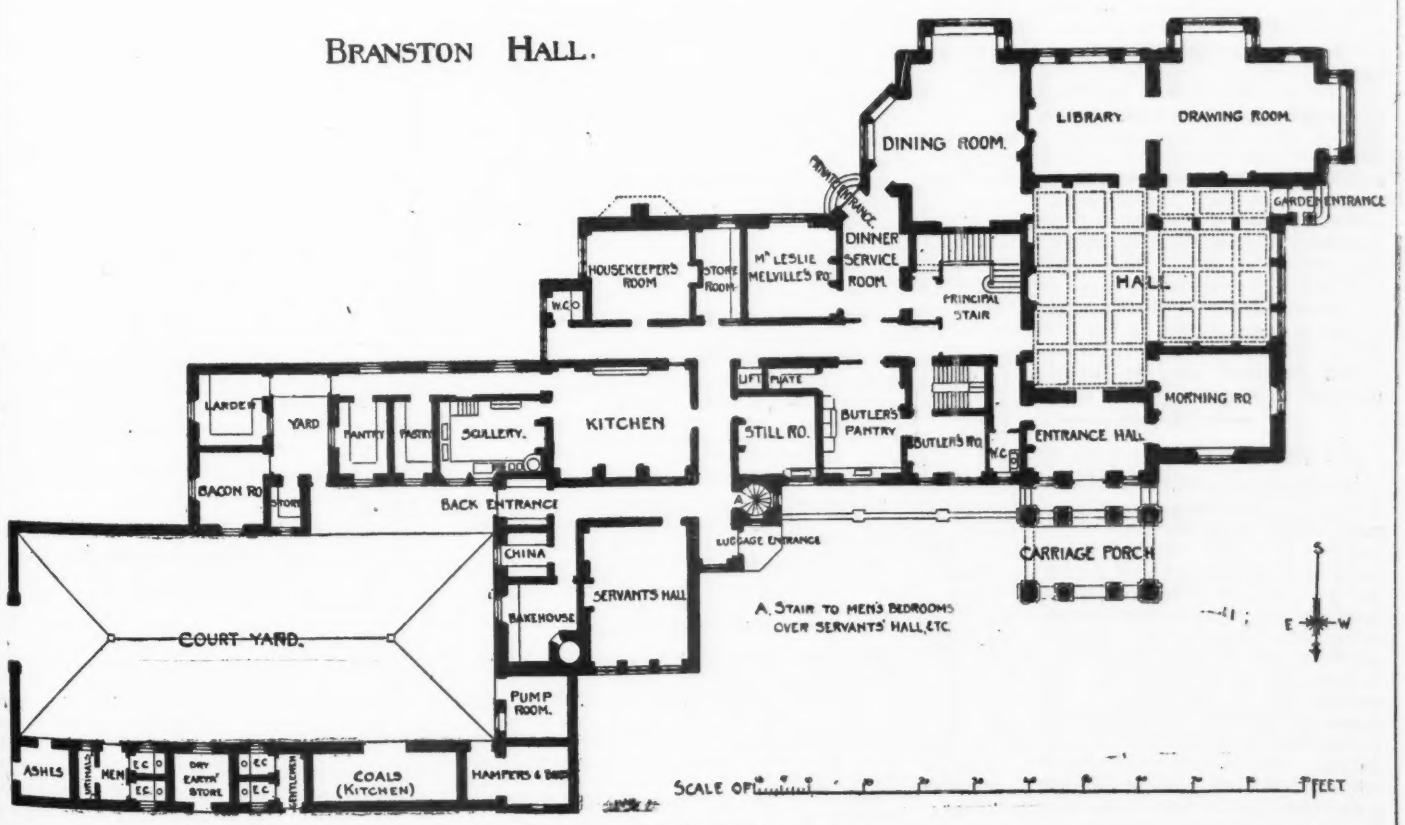
### BRANSTON HALL, LINCOLNSHIRE.

Branston Hall is about five miles from Lincoln, and may be regarded as a typical illustration of a gentleman's moderate-sized country house.

As the plan of the ground floor only is published, it is necessary to explain that in the basement floor are the brushing-room, drying-room, shoe-room, lamp-room, and large wine, beer, wood, and coal cellars, the latter being




*Presbyterian Church, Mansfield-road, Nottingham. Plan.*




*Branston Hall Lincolnshire. Plan.*

adjacent to the lift. In the principal bedroom floor are the family bedrooms and the principal bed and dressing rooms for visitors, and in the attic floor there are single rooms for visitors and the maid-servants' bedrooms, the men-servants' bedrooms being placed over the servants' hall building, and accessible by a separate stair. The total number of bedrooms is thirty-eight. The house was built from the weather bed of the Ancaster stone quarry, the roofs being covered with green Westmoreland slates.

The builders were Messrs. E. Lawrance & Sons, of London, and the architect Mr. J. MacVicar Anderson.

## DESIGN FOR AN ENTRANCE TO A PUBLIC GARDEN.

This design, by Mr. H. Inigo Triggs, obtained the Royal Academy's 25*l.* prize, in the Upper School of Architecture, for the best architectural design on a given subject.

The design is both original and graceful in effect, and shows a novelty of treatment for this kind of subject. If we may make one or two criticisms, we should suggest that a little more importance should have been given to the central carriage entrance, by making the archway rather larger and higher. It is too nearly the same size as the arches of the flanking arcades, and consequently does not dominate sufficiently. Secondly, the plan of the walks and parterres round the pools shows rather a confusion of lines—we have a circular central pool, then the octagon line of the borders, then behind this straight side of the octagon the quadrant line of the flower-bed. The objection is perhaps more apparent on plan than it would be in perspective, but still we think it exists. Third; the tea-room would be rather deficient in light towards the entrance end.

The open loggia round the forecourt, with the iron grilles alternating with open arches, is a very pleasing feature in the design.

## THE POST OFFICE LONDON DIRECTORY.

The 101st annual issue of this invaluable Directory (Kelly's Directories, Limited) shows that the work is still growing, for, with its 3,317 pages, exclusive of advertisements, it has increased in size by forty-one pages over the edition of 1899. The present edition contains no feature of novelty; indeed, one cannot conjecture how it could do so advantageously, seeing that in its present well-known form it fulfils all the requirements of a thoroughly reliable and complete Directory of London. Its only defect is its size, for the work has become quite bulky—though that, of course, is no discredit to the publishers. Some notes descriptive of the changes in topography and landmarks of the metropolis during the century through which the Directory has been issued, which appeared last year, have been inserted again in this edition, and such notes would form a useful addition to subsequent issues of the Directory if amplified to some extent and brought up to date. The corrections have been brought down to the latest possible date: Sir Henry Tate, who died on the 5th inst., no longer appears as one of the Trustees of the National Gallery in the official division.

The excellent map of London is again mounted on linen.

## DIARIES, &c., FOR 1900.

We have received from Messrs. Hudson & Kearns (83, Southwark-street, S.E.) a parcel of their excellent diaries and blotting pads, the merits of which most of our readers are familiar with. Prepared for the use of architects and builders, the diaries leave little or nothing to be desired; they are well arranged, and the information they contain is just what practising architects and builders need from day to day. We are glad to notice that the section "Architecture and Archæology," containing the names of officials of architectural and other professional societies, has been revised to some extent. The "Architects' Diary" is issued in two sizes, Nos. 12 and 13 (one and two pages to a day respectively) and in the Builders' Diary, No. 11, two days are represented on each page. The diaries are suitably bound and admirably arranged. The blotting pads issued by Messrs. Hudson & Kearns are well up to their usual standard of excellence. We may specially mention the Bankers' edition and No. 8*a*, which comprise a diary, blotting pad, and date remembrancer. No. 4 is also a very handy form of a folding blotting pad and diary.

"Sprague's Pocket-Diary and Architects' and Surveyors' Memorandum Book" for 1900 is the reissue, by Messrs. Sprague & Co., of a useful and neat little pocket-diary. The professional information (architects' tables, &c.) is put in a very concise way.

Messrs. Waterlow Bros. & Layton, Limited, (Birchin-lane, E.C.) have sent us their handsomely bound and printed "Architects', Surveyors', and Auctioneers' Diary and Almanac" for 1900. The diary portion contains a page to a day; and the information includes lists of Fellows and Associates of the Institute of Architects, the Surveyors' Institution, Institution of Civil Engineers, and a mass of useful information to members of the profession and others. It is a specially useful work, and appears to be up-to-date and reliable.

"Smith's County Court Diary," for 1900, (John Smith & Co., 52, Long Acre) is the fifty-third year of publication of a useful and well arranged diary. The work contains a mass of information relating to County Courts, and it has been specially adapted for the use of the officers and practitioners of the courts. It has been got up in a very neat form.

"The Royal Navy List Diary and Naval Handbook" for 1900 (Witherby & Co., 326, High Holborn), contains, amongst other interesting matter, articles on the tides, terrestrial magnetism, and naval officers as eclipse observers. It also includes a table giving the colours of the medal ribbons of the various British war medals, orders, and decorations granted to the Royal Navy during the nineteenth century. The diary portion is arranged to give a page to a day.

"The City Diary" for 1900 (W. H. and L. Collingridge, 148, Aldersgate-street, E.C.) is the thirty-seventh year of publication of a very handy and useful little diary. It has been much enlarged, more space having been devoted to the diary proper, which is interleaved, as usual, with blotting-paper. This is a point which might be remembered by other publishers, as too often the diary proper is almost lost in the general, but useful, information found in the work. The information in the City Diary, which is of special value as to Corporation and City affairs, has been revised and in several respects extended and improved.

"The Railway Diary and Officials' Directory" for 1900 (London: McCorquodale & Co., Ltd.) contains all the useful features of past issues and, in addition, this year a list of telegraphic addresses and telephone numbers of chief railway officers has been inserted.

"'The Mechanical World' Pocket Diary and Year-book" for 1900 (Emmott & Co., Ltd., New Bridge-street, Manchester) is the thirteenth year of publication of a handy little diary, the greater part of which, however, consists of useful engineering notes, rules, tables, and data. If the diary portion proper were enlarged, the work would be of more value.

Messrs. Bemrose & Sons, Ltd. (23, Old Bailey, E.C.), have sent us their neat little "monthly diary" (published at 1s.), and we have received from Messrs. George Rowney & Co. "The Artists' Almanac" for 1900—a neat little pocket almanac and diary, giving information as to the picture galleries.

## BOOKS RECEIVED.

Waterworks for Small Cities and Towns.—By John Goodell (*Engineering Record* Office, New York).

Primera Reunion del Congresso Cientifico Latino-Americano. (Compañía Sud-Americana, Buenos Aires.)

Sanitary Inspectors' Examination Board.—The following passed as Sanitary Inspectors in the December examination: Mr. W. J. Coleman, Mr. A. E. Didier-Garnham, Mr. S. H. Kemp, Mr. T. D. Young, all of King's College, London; and the following ladies, all members of the National Health Society: Miss M. Le F. Boileau, Miss G. E. M. Church, Miss Julia Hancock, B.A., Miss R. B. W. Holmes, Miss E. C. Honey, Miss M. K. Le Lean, Miss D. B. Meeson, Miss F. M. Nicholas, Miss M. W. Richardson, Miss C. F. Stephens, Miss A. E. Turner, Miss A. M. S. Tweeddale.

## Books.

*Modern American School Buildings.* By Warren Richard Briggs. New York: John Wiley & Sons. London: Chapman & Hall. 1899.

We fear the publication of this book in England is rather a mistake; at least, its only value will be for those who are interested in learning all about American architectural practice. It will certainly not teach English architects anything in school planning which they cannot learn better from English books and English experience. The author seems, indeed, to have some misgivings himself as to the state of school architecture in America. He remarks that "more money is expended each year in the United States in the construction and maintenance of public school buildings than is used for a like purpose in all the other countries of the world combined"; and this is very likely true; there is probably no country in which the value of and the necessity for education is so generally recognised; we know from the evidence of Bret Harte that a school-house and a "school-marm" were among the first recognised requirements, even at such pioneer diggings as Red Dog and Poker Flat. "Can it be said, however," adds the author, "that our school buildings have kept pace with our educational systems?" and if the plans in his book represent (and they probably do represent) the best that has been done in American school-planning for primary and secondary schools, we should think the answer must be decidedly in the negative.

The architectural designs of the exteriors (mostly, we gather, the author's own) are in most cases pleasing; but the plans display an astonishing naïveté of treatment. The question of aspect of class-rooms, school-rooms, and play-rooms seems to be entirely ignored; not a single plan has a compass on it, and in general the problem seems to be solved by the simple expedient of placing boys' rooms on one side of the axial line, and those for girls on the other, the windows facing to the opposite quarters; so that if one set of rooms has the best light for its purpose the other must inevitably have a bad one. No scales are given on the plans, and not even a statement is given in the preface as to what scale they are drawn to. A minor but not unimportant drawback is that, by an oversight only too common (as we know from painful experience) in preparing plans for publication, the explanatory writing on them has been made without due regard to the effect of reduction, with the consequence that a good deal of the writing—names of rooms, &c.—is only legible with a magnifying glass. Such a set of plans can be of no use to any English school-building architect.

We may take one or two points here and there which are worth note. The author complains, and truly, of the disagreeable atmosphere of hat and cloak rooms in wet weather; though when he says that they are "usually unventilated" he is again illustrating how much the American school architect is behind the age. But his suggestion, carried out in the Bridgeport High School building, of hanging hats and cloaks in open railed-off spaces along the walls of the large hall, where "the damp and uncleanly clothing becomes purified by the constant circulation of pure air," is worth consideration; the result must be unsightly, but it may be more sanitary than the confined cloak-room. The arrangement for securing constant extract ventilation from the water-closets, in the same school (p. 208-9) is also worth attention in cases where there is no mechanical system of ventilation employed.

In regard to general systems of warming and ventilation it appears from Mr. Briggs' evidence that opinion is very much divided in America between the merits of the indirect system, of heating by coils in the basement and the introduction of warmed air into the rooms, and the direct system, by coils in the rooms. Mr. Briggs is apparently rather in favour of the indirect system, while admitting two objections to it—loss of heat in transit, and the partial filling up of rooms in the basement with the coils and boxes, rendering the rooms of little practical use. In the Bridgeport High School (which we refer to again because it appears to have been one with which exceptional trouble was taken) the coils were placed in the main ventilating shaft in the centre of

the building, and the air conveyed from them through these shafts to the rooms, by means of metal tubes. The inlets are all near the top of the rooms, the outlets not only at the bottom but under the platform of the teachers' dais (which is built hollow), so that the air shall not be encouraged to quit the room without having well circulated in it. There are some small sectional diagrams given to show that with the entry at the bottom and the outlet at the top, or with the outlet at bottom but at the opposite side of the room, the current of fresh air passes above persons seated at the ordinary level. Diagrams of this kind can, of course, be made to illustrate any theory; but if, as the author implies, they are copied from the result of smoke tests, they are worth consideration. Experience in this country also seems to be rather tending towards the preference of extraction at the floor level. The author's theory on the subject, pp. 249-250, is however rather absurdly stated, as if it were an object to have pure air at the top of the room—in fact his statement at this point seems to be almost an inversion of the actual facts, unless he has not succeeded in stating clearly his own meaning.

On one or two points in general practice Mr. Briggs gives us some insight, more amusing than he is aware of, into the state of professional opinion in America. In his remarks on the manner in which the architect may make extra gains by collusion with contractors—permitting work to be executed with inferior material to that specified, specifying particular goods and getting a commission for so doing—it is true that he speaks of "inferior architects;" but the sentence, "these are a few only of the many ways and means employed, and unless the client is an expert in such matters or more than usually alert, such things pass unnoticed," looks very much as if the warning to the client was considered by no means superfluous. Some of the remarks on competitions are still more curious. The author relates how, in relation to a certain competition, he was told of an architect from New York who was "a hustler," who had been up several times and seen all the committee more than once, and that he had better follow this active example, if he wished for any chance of success. The author's mild comment is as follows :—

"Unquestionably this man had a perfect right, from a business standpoint, to do just what he did. Ethically, had he an equal right? He would protest that he had done nothing unprofessional; that his methods were legitimate and above-board; that he made no secret of seeing the committee; and that others had the same privileges. This is all true, *but it is not to my mind, in the true spirit of a competition.*"

The last remark is really touching in its simplicity.

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*Chimney Design and Theory.* By WILLIAM WALLACE CHRISTIE, M.Am.Soc.C.E. E. & F. N. Spon, Ltd. London, 1899.

LITERATURE bearing on the subject of chimneys has not been overdone; in fact, it has not received the amount of attention which its importance deserves. We do not refer so much to the ordinary domestic variety as to boiler chimneys, which almost exclusively form the subject matter of Mr. Christie's book. The former class, as exemplified in dwelling-houses, calls for comparatively little either of constructive genius or of mathematical labour. Boiler chimney-shafts, on the other hand, demand much of both, and it is a matter for surprise that no really comprehensive work dealing with their theory, construction, and design has hitherto been published in this country. We fear that it is too often the rule for architects to leave the proportions of such structures either to be settled by firms who have contracted for the supply of the boilers or to be governed by dimensions obtained from some other chimney presumably, but not necessarily, performing similar functions. In either case the architect fails to justify his position, and to conform to the standard which should influence all his work. As Mr. Christie very properly remarks: "Nothing in a steam plant is so conducive to great waste of fuel as a badly designed chimney; and it may be made the means of assisting or increasing a high efficiency in the plant, if properly proportioned for the quantity of gases which is to be passed through it." In the United States there has been a lack of information in book form on the subject similar to that prevailing in England, and the publication now under review is intended by the author to supply the gap in the literature of both countries. This gap, we are disappointed to find, is not filled by Mr. Christie, for although his book contains much valuable information, it must be regarded as a compilation of notes rather than as a treatise, and we are inclined to think he understands chimneys more familiarly than the writing of a book upon them.

The earlier chapters, dealing with theories of chimney craft, chimney formulæ, wind pressure, and combustion, consist mainly of extracts from technical publications, and of rules and deductions by authorities such as Péclet, Rankine, D. K. Clark, Adams, Kent, Thurston, Trowbridge, and other English and American scientists. There are also some tables by the author which should be useful and satisfactory to practical men, though judgment and care must always be exercised in their application. Similarly, the brief section devoted to the foundations and materials of brick chimneys is almost entirely built up of quotations from the Building Laws of New York, Chicago, and Boston, interspersed with records of tests at Watertown Arsenal, and of others reported by American journals. Some press comments are also given, including one from the *Builder*, but very little original literary matter.

Next in order we find a much more satisfactory chapter in which steel chimney-shafts are thoroughly discussed. Here, for the first time, the author does himself justice, and his dissertation upon the foundations, anchorage, and construction of guyed and self-sustaining steel shafts is worthy of respectful attention. This chapter is rendered the more valuable by figured sectional drawings, and also by photographic illustrations of existing chimneys accompanied by detailed descriptions. In our opinion, steel is by no means a suitable material for the construction of chimney-shafts, except in special instances. Unless lined with fire-brick, the metal would have a very short life—for example, the funnel of a steamship requires renewal after about ten years' use; and if lined, the cost is at once greatly increased. There must obviously be marked differences in the expansion of brick and steel work, and it is undesirable that the two sides of a metal surface should be exposed to extreme variations of temperature, such as must be found even in the upper part of a steel chimney.

The remaining part of the book is chiefly relative to brick chimneys, and here again we find the theoretical and other rules involved to be simply collated from Molesworth, Rankine, &c., whilst the descriptive matter consists almost entirely of extracts from American newspapers and journals. It is true that the value of these is augmented by sectional and other illustrations, but once more we miss the comparative and analytical treatment which would add so much to the value of the work. Mr. Christie has compiled a useful combination of note-book and scrap-book, but he has not written what is still wanted, a coherent and comprehensive treatise on the theory and design of chimney-shafts.

The book is a purely engineering one, and takes no account of the question of design in an architectural sense, in which some American architects have made very good suggestions. The chimneys shown in this book are all as ugly as they can well be. The steel chimney it is impossible to do anything with in this sense, but a good deal may be done with a brick chimney, without in any way interfering with its practical objects.

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*The Prevention of Factory Accidents, being an Account of Manufacturing Industry and Accident, and a Practical Guide to the Law on the Safe-guarding, Safe-working, and Safe-construction of Factory Machinery, Plant, and Premises; with Twenty Tables and 124 Illustrations.* By JOHN CALDER, Whitworth Scholar, Sometime H.M. Inspector of Factories for the North of Scotland. London: Longmans, Green, & Co., 1899.

MR. CALDER must be congratulated on having found a new subject for a book and on having made good use of his opportunity. When we remember that accidents in the United Kingdom cause annually about 80,000 injuries and nearly 4,000 deaths, the importance of the subject is impressed upon our minds. When we further remember that less than one-fifth of these fatalities occur in "factories and workshops," as now defined by law, we cannot but agree with Mr. Calder when he advocates the extension of the existing definitions so as to bring more trades and occupations within the scope of the law. The book is divided into three parts. The first part treats of "Manufacturing Industry and Accidents," and contains many valuable tables on the prevalence and causes of accidents in different trades, and an account of a year's working of the Workmens' Compensation Act, 1897. Part II. is entitled, "The Prevention of Accidents," and occupies more than half the book. It deals chiefly with the fencing of machinery, separate chapters being devoted to the safeguarding of prime movers, mill-gearing, hoists and lifting tackle, dangerous details of machinery, and dangerous machines. In the last-named chapter wood-working machines occupy a prominent place, no fewer than twenty-one illustrations being devoted to the safeguarding of saws, planing-machines, &c. The remaining chapters of Part II. contain the author's views on lighting, heating, fire-risks, fire-escapes, and other matters germane to the subject. Part III. is a summary of the "Text of the Law on Accidents and Safety in Factories.' Such in brief is the scope of the book. It is clearly written, adequately illustrated, and well printed. Mr. Calder has done a public service by collecting and publishing the information it contains. If the suggestions contained in the book were carefully carried out by masters and workmen, the terrible roll of accidents which now discredits our industries would soon be greatly reduced.

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*Practical, Plane, and Solid Geometry, with Class Sheets.* By JOHN S. RAWLE, F.S.A. Sixteenth Edition. London: Simpkin, Marshall, Hamilton, Kent, & Co., Limited. 1896.

IF we were asked to designate the little volume compiled by Mr. Rawle, we should be inclined to call it an elementary text-book on geometrical drawing. Such an expression would convey to the intending purchaser a more accurate idea of its contents than the somewhat ambitious and certainly comprehensive title actually chosen. The particular branch of geometry of which the elements are expounded by the author, is of value to art students of every kind. It is, of course, essential to the architect and to the engineer, as well as to the artisan who aspires to become master of his craft, and is a subject to which prominence is given in the examinations of the Science and Art Department and of other educational bodies. Previous editions of the work in question have been received with a considerable amount of favour, and the current issue embodies alterations and additions which ought to enlarge its general sphere of usefulness. Consisting essentially of tersely-stated definitions, notes and problems, accompanied by more than 600 diagrams, the text-book commences with a brief explanation of elementary data, followed by a course of instruction dealing with the solution of simple problems presented by various matters of detail, and finally it exemplifies the manner in which the knowledge so acquired may be applied to some forms of practical work. The class sheets, published separately and to be used in conjunction with the text-book, are somewhat superfluous, and appear likely to discourage rather than to stimulate self-reliance on the part of the student.

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*Freehand Drawing Test Papers.* By JOHN S. RAWLE, F.S.A. Tenth edition. Simpkin, Marshall, Hamilton, Kent, & Co., Ltd., London.

PROBABLY there is nothing more dreary and apparently more unprofitable to the student who is gifted with a natural aptitude for sketching, than freehand drawing as frequently understood. In the sense to which we refer it involves the merely mechanical reproduction of a simple design, so that line for line it shall be identical with the copy. No scope is given on the one hand for the exercise of taste in treatment, nor on the other hand may the least use be made of any mechanical aid, such as would, as a matter of course, be adopted in practice, even by an expert. Freehand drawing of this kind is a dispensation of Providence, and as such must be accepted with resignation, more especially for the reason that it forms a necessary part of some examinations. We have known many cases in which candidates thinking a really "freehand" represen-

tation to be all that was required, have performed their task in an apparently admirable manner within the space of a few minutes, only to learn afterwards of their failure, because of some minute and trivial deviation.

The practice of so-called freehand drawing is, however, really beneficial, as tending to promote mechanical accuracy and to train the eye in judging distances, much as the five-finger exercises and the scales impart execution to the budding pianist. The set of copies prepared by Mr. Rawle are valuable as affording an index to the requirements of various examining bodies, and the detailed instructions which accompany them should prove useful to students, especially to those possessing little aptitude for this particular department of art.

# The Student's Column.

## ROADS: THEIR CONSTRUCTION AND MAINTENANCE.

### PART IV.—MAINTENANCE (*continued*).

### 27. COST (*continued*).—CONCLUSION.

THE first cost of paved roads is naturally much greater than that of macadam; but when the probable duration of the pavement and diminished annual cost of maintenance are considered, these are often in the end the cheapest. A comparision of the total expense of these two classes of road may be drawn from the following figures, taken from an actual estimate prepared for one of our Midland cities :—

| | Granite setts, on concrete foundation 6 in. thick. | Macadam. |
|---|---|---|
| Cost of construction, for an area of about 8,000 square yards ..... | £4,375 | £1,190 |
| Cost of sinking fund and interest for thirty years at 223*l.* per annum ..... | 6,690 | — |
| Cost of annual repairs for thirty years at 243*l.* per annum ..... | — | 7,290 |
| Cost of scavenging and watering for thirty years..... | 2,310 | 5,940 |
| Total cost of pavement, with maintenance for thirty years.... | 9,000 | 12,230 |

From these figures it is seen that although the first cost of the paved road is nearly four times that of macadam, being at the rate of 12s. per square yard for the former against 3s. 3d. for the latter, yet in the long run there is a saving of more than 3,000*l.* in favour of the larger outlay, exclusive of the cost of sinking fund and interest in respect of the first cost of the macadam. In the case of roads subjected to excessive traffic, the difference will be found to be still greater, owing to the excessive cost of maintenance of macadam under such conditions. It is stated that the cost of maintaining macadamised roadways may reach as much as five times that of a road paved with granite setts. This excessive yearly cost, if capitalised for only twelve or thirteen years, would counterbalance the outlay, interest, and cost of maintenance of the granite pavement.

In the above figures the first cost of the granite sett pavement is perhaps rather below the average. In London a pitched roadway formed of granite setts, on 6 in. of Portland cement concrete would cost about 17s. per superficial yard. There will, of course, be a considerable difference in different localities, and with different materials. The influence of the cost of materials is shown in the accompanying table exhibiting the prices of some well known setts in use in this country :—

*Comparative Prices of Setts, per ton (free on rail).*

| | 3 in. by 3 in. | 3 in. by 5 in. | 3 in. by 6 in. | 4 in. by 4 in. | 4 in. by 6 in. | 4 in. by 9 in. | 3½ in. by 6½ in. |
|---|---|---|---|---|---|---|---|
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Mount Sorrel .. | 24 0 | 19 0 | 22 0 | 19 0 | 18 6 | 18 0 | — |
| Stoney Stanton.. | 21 0 | 19 0 | 21 0 | 18 0 | 18 0 | 18 0 | — |
| Enderby ..... | 21 3 | 19 6 | 22 0 | 19 3 | 19 3 | 20 0 | — |
| Charnwood Forest ..... | 17 0 | 17 0 | — | 17 0 | 16 0 | — | — |
| Markfield ..... | 22 6 | 19 6 | 21 6 | 19 6 | 19 6 | 19 6 | — |
| Rowley Rag .... | — | 14 2 | 14 2 | 12 1 | 13 7 | — | — |
| Guernsey ..... | — | 21 0 | 23 0 | 23 0 | 19 0 | 18 0 | — |
| Penmaenmawr .. | — | — | — | 18 0 | — | — | 16 6 |

*Cost of Cleaning Old Setts.*—When old setts are used again the grouting of bitumen or cement must be first cleaned off. This, when done by hand by means of a sett-cleaner's hammer, costs about 10½d. per square yard. But bitumen grouting can be cleaned at an expense of only about 4d. per square yard by boiling the old setts in a pitch-boiler with creosote oil heated to 270 deg. Fahr. The value of old setts depends greatly upon their condition, and may be roughly estimated at between 1s. 6d. and 3s. per square yard.

*Cost of Wood Pavement.*—In estimating the cost of wood pavement in large cities where the traffic is exceptionally heavy, it must be borne in mind that natural decay has scarcely time to play any part owing to the rapidity of wear by mechanical agencies. In such cases the expense of creosoting, except for sanitary reasons, is almost superfluous. Then again, in deciding between the use of hard or soft woods, in which there is a considerable difference in expense, many circumstances have to be considered. Hard woods, although more costly, have a longer life, and involve less frequent obstruction of traffic for the purpose of renewals; although, at the same time, they are more noisy and also more slippery than soft woods.

Exclusive of the expense of laying, the mere cost of the blocks of Jarrah and Karri is nearly double that of deal. The following may be taken as the approximate cost per square yard, and probable duration of wood-block pavements :—

| Kind of Wood. | Size of Block. | Cost. | Duration. |
|---|---|---|---|
| | | s. d. | Years. |
| Karri ..... | 9 × 3 × 4 | 10 6 | 16 |
| Jarrah ..... | 9 × 3 × 4 | 11 6 | 14 |
| Deal (creosoted) .... | 9 × 3 × 5 | 7 6 | 8 |

As regards duration, however, nothing can be stated positively, since the use of hard woods has not continued for a sufficiently long period for any pavement of this kind to have worn out.

The annual cost of maintenance of wood pavement is small, being practically nothing for the first three years, after which it increases gradually until the wood is worn out. Approximately the annual cost may be taken as from 3d. to 7d. per superficial yard.

The difference in the cost of creosoting yellow deal blocks may amount to about 1s. 2d. per superficial yard. The expense of grouting varies with its nature, pitch grout costing 7d., and cement grout 6d. per superficial yard.

In general, a fixed charge is usually made per square yard for construction of wood pavements, including the cost of concrete foundations, but exclusive of any necessary excavation. The cost varies with different systems of paving, but may be taken roughly at about 14s. per yard. Maintenance is also generally undertaken for a fixed period at a fixed rate, averaging from 1s. to 1s. 6d. per square yard per annum, no charge for repairs being made for the first year or two years, according to agreement.

Some authorities prefer to buy the timber by the load, and cut it into blocks themselves. One load of timber, costing about 6*l.*, may be cut into about 640 blocks, the cost of cutting by a steam-saw being about 4s. 9d. per 1000. This brings the total cost up to about 9*l.* 10s. per 1,000 blocks.

*Asphalt.*—As in the case of wood pavements, it is the usual practice of asphalt pavement companies to charge a fixed price per square yard for laying, inclusive of foundation, and to undertake the repairs for a fixed period at a certain agreed price. Generally the period agreed upon for maintenance is seventeen years at from 6d. to 10d. per square yard per annum, the repairs for the first two years being free. In London the initial cost is about 12s. 6d. per square yard.

The following table shows at a glance the relative cost of the above descriptions of pavement compared with that of macadam, and with regard to the duration and total cost of each for a given term of years. It is clear that this is the only way in which a true comparison can be drawn between them, and their advantages properly appreciated. In the place of the annual cost of repairs which are necessary for macadam roads, is put, in the case of paved roads, the annual cost of a sinking fund and interest with respect to the original outlay.

COMPARATIVE COST.

| Description of Roadway. | Initial cost of construction per square yard. | Probable life of pavement. | Annual cost, *i.e.*, repairs, sinking fund, and interest per square yard. | Annual cost of scavenging and watering per square yard. | Total cost per square yard for a period of thirty years. |
|---|---|---|---|---|---|
| | s. d. | | | | £ s. d. |
| Macadam ..... | 3 3 | — | 7·3d. | 6d. | 1 16 6 |
| Granite setts, on concrete foundation, 6 in. thick .. | 12 0 | 30 | 6·7d. | 2·3d. | 1 14 6 |
| Australian hard wood, on concrete foundation, 6 in. thick..... | 18 0 | 18 | 1s. 2·4d. | 4·6d. | 3 17 6 |
| Creosoted deal, on concrete foundation, 6 in. thick | 12 0 | 12 | 1s. 1·3d. | 4·6d. | 3 14 9 |
| Compressed asphalt, on concrete foundation, 6 in. thick..... | 13 6 | 15 | 1s. 0·5d. | 2·8d. | 3 5 3 |

This table refers only to a particular case, and must not be taken as universally applicable. For example, the annual cost of repairs in the case of macadam roads, as has already been pointed out, will not be the same in any two cases, but will depend entirely upon the amount of traffic. If in the above table we place the annual cost of repairs of macadamised roads at 1s. 7d., a sum by no means excessive for busy thoroughfares, the total cost would amount to 3*l.* 5s. 9d. per square yard in thirty years, and would thus exceed that of compressed asphalt.

Problems of cost, of which the above may be taken as an example, will continually arise in connexion with road management, and no greater mistake can be made than to assume that real economy will necessarily result from the smallest outlay. The true cost of a road can only be properly estimated when it is considered in conjunction with its duration and expense of maintenance. In France it is generally considered that a change from macadam to some form of paved road is fully justified, on the score of economy alone, when the annual cost of maintenance exceeds 2s. per square yard; and this change is being effected year by year at an outlay which has sometimes reached half a million sterling. This outlay, large as it may seem, is amply repaid in the long run. Good roads attract population and increase the value of the adjoining lands. They diminish the distance between neighbouring places and decrease the cost of transport, at the same time promoting intercourse and commercial development. The cost of bad roads to the whole community, both in loss of time and in the wear and tear of horses and vehicles, will be found in many cases to be greater than the outlay necessary to restore the roads to a proper state of efficiency.

*Conclusion.*—We have now had before us all the more important considerations with which the road-maker is concerned, and in bringing to a close this series of articles it will, perhaps, be useful to recall some of the chief points which it has been endeavoured to bring into special prominence. In no branch of engineering is there a greater diversity both of opinion and of practice than in road construction, and the student may well be bewildered at the numerous contradictory statements which he meets with in the current literature of the subject. The reason for this want of agreement is not far to seek. It is to be found in the varying conditions which prevail in different districts, and in the different circumstances both of traffic and also of natural adaptability to particular modes of treatment.

Consequently fixed rules and stereotyped methods, which shall be universally applicable to all cases, are almost impossible to devise. It is only in general principles that any agreement can be expected, and it is these principles which it has been the chief object of these articles to exemplify, rather than details suited only to particular cases. The road surveyor of

all people should preserve an open mind, free from prejudice and preconceived bias. To carry into a new district practices adopted with success elsewhere, under totally different conditions and requirements of traffic, would in many cases be a most certain way to complete failure.

One of the great difficulties experienced in every rural district is the question of materials. There is scarcely any part of these islands where some kind of stone is not available for road metal; and this local stone, though often of the poorest quality, has in many cases to be utilised on account of the great expense of importing better material from a distance. But if this importation is deemed advisable, let it be of the very best stone that the country affords. Half measures are almost certain to be failures from the points of view both of economy and efficiency.

The question of construction, also, does not affect new roads alone. Many of our existing roads will never be satisfactorily or economically maintained until they have been completely remade. This somewhat drastic remedy will, moreover, be in the end the cheapest course to pursue, and should even involve, in many cases, not only the remaking of the road from foundation to surface, but also necessary improvements both in alignment and gradient. Lastly, let it be remembered that successful road-making is a science which requires the application of a wide range of practical knowledge. The days are gone by when any one might consider himself qualified to undertake the care of our public highways. Good roads are a necessity of present-day conditions of life; and the time is not far distant when not only our main roads, but also our parish roads and by-ways, will be required to be made up to that standard of perfection which the needs of an advancing civilisation demand.

To quote the words of an eloquent writer, "The road is that physical sign or symbol by which you will best understand any age or people. If they have no roads they are savages, for the road is the creation of man and the type of civilised society."

Nor is the day far distant when this same civilised society will demand not roads only, but the very best roads which the highest resources of engineering skill are capable of producing.

## *OBITUARY.*

MR. E. MILNES.—We have to record the death of Mr. E. Milnes, senior partner of the firm of Messrs. Milnes & France, of Bradford, architects, which took place on Thursday, December 7. Mr. Milnes, who was sixty-nine years old at the time of his death, was a son of the late Henry Milnes, of Tollerhall, Manningham, and was articled to Mr. Walker Rawstone, of Bradford. He subsequently entered into partnership with the late John Dixon, after whose death he practised for some while alone. In 1863 he took as partner Mr. Charles France, and in 1888 his son, Mr. Charles C. Milnes, and Mr. A. A. France entered the firm. Mr. Milnes was the architect of many large warehouses and business premises in Bradford, including those of Messrs. A. & S. Henry, the Bradford District Bank, Beckett's Bank, and the Swan Arcade. He acted for the Corporation in carrying out several street and other local improvements, was an original member of the Bradford Architects' and Surveyors' Society, and was a life-governor of the Royal Infirmary, Bradford. Mr. Milnes married twice, and leaves a widow and eleven children. Of the firm's architectural works in Bradford the following were illustrated in the *Builder* of February 19, 1898:—Beckett's Bank, the Swan Arcade, and the Royal Victoria Nurses' Home.

## *GENERAL BUILDING NEWS.*

BOARD SCHOOL, MANCHESTER.—The memorial stone of a new Board school—the thirty-second school erected by the Manchester School Board—was laid recently in Moston-lane, Moston. The school, when completed, will accommodate 1,230 children (450 infants, 390 boys, and 390 girls). The total probable cost, with the site, is estimated at 21,000*l*. The site has an area of 8,700 square yards, and there is accommodation for extension. The principal front of the school will face Moston-lane, and each department will have separate entrance and exit. The infants' department, which is to be upon the ground floor, will comprise a hall, 62 ft. by 35 ft., and eight class-rooms, as well as cloak-room and two rooms for the principal and assistant teachers. Provision is also to be made upon this floor for an art school-room, manual instruction room, cookery-room, laundry, and store-room. The boys' and girls' departments, on the upper floor, will each have a hall 50 ft. by 35 ft., and capable of being thrown into one large hall, six class-rooms, a cloak-room, and two teachers' rooms. The work is being carried out by Messrs. A. R. Bullivant & Sons, contractors, from the designs and under the supervision of Messrs. Royle & Bennett, architects, Manchester.

THE GROSVENOR HOTEL.—It is stated that arrangements will shortly be concluded between the Brighton Railway Company and the "Gordon Hotels, Limited," under which the Grosvenor Hotel, which was recently purchased by the Brighton Company, will be opened for the next London season under the administration of the "Gordon Hotels, Limited." The furnishing and decorations will be carried out by Messrs. Maple & Co. Structural alterations, involving the closing of the hotel for three or four months, will be carried out under the supervision of Mr. Alfred Waterhouse, R.A., and Mr. Morgan, the Brighton Company's Engineer.

DRILL HALL, SALFORD.—The new drill hall and head-quarters of the 3rd Volunteer Battalion Lancashire Fusiliers, in Cross-lane, Salford, were opened by Colonel Lees Knowles, M.P., on the 8th inst. The building is constructed of Accrington red brick, relieved by white brick and stone dressings. The main entrance is in the centre of the frontage, and is surmounted by a massive square tower with embattled copings. At the extreme left of the frontage is a circular turret. The ground floor contains the adjutant's, clerks', and examination rooms to the left of the main entrance, and to the right are the men's quarters, consisting of two rooms with refreshment bars. On the first floor are the officers' and sergeants' quarters, the former being approached by a staircase. The rooms comprise billiard, smoke, and reading rooms. Behind the headquarters is the drill hall, measuring 154 ft. long by 72 ft. wide. A balcony, entered from both the officers' and men's quarters, is placed at the end of the room. The floor is asphalted. Armoury and ammunition stores are attached. The building is lighted throughout by electricity and gas. In addition to the drill hall there is a drill ground 188 ft. long by 90 ft. broad adjoining. The new buildings have cost about 7,000*l*. Messrs. John Eaton, Sons, & Cantrell, of Ashton-under-Lyne, are the architects, and Messrs. Edwin Marshall & Sons, also of Ashton, the contractors.

PLYMOUTH'S NEW MARKETS.—The last block of buildings in connexion with the reconstruction of the Plymouth Corporation markets is now practically completed. This block comprises the site of the old poultry, fish, fruit, and vegetable markets, which were divided into three separate sections. The new market is one large open building, under one roof of three spans, and occupies a superficial area of 36,750 square ft. On the south side are placed the poultry, game, and fish stalls, whilst on the east side are similar stalls. The open stands for fruit and vegetables in the occupation of daily holders front the poultry, game, and fish stalls. The remaining portion of the block is taken chiefly on market days. There are three main entrances to the market—one from Drake-street, another from Market-avenue, and a third from Cornwall-street. A central roadway from Drake-street to Cornwall-street provides for the delivery of goods and free access to all parts of the block. The market inspector's residence and offices are located on the west of the Cornwall-street entrance, where also are placed the meters and switches connected with the electric lighting, which has been installed under the direction of the Borough Electrical Engineer. The old "Market Hotel" site, situate on the north side of the Drake-street entrance, is now occupied by the new offices of the weights and measures department. The contract for the reconstruction of the whole of this last block has been carried out by Mr. W. Trevena, from the drawings and instructions of the architects, Messrs. King & Lister, of Plymouth.

RETAIL MARKETS FOR LEEDS.—For some time the Leeds Corporation have been endeavouring to supplant the existing Kirkgate market, and they recently offered premiums for the three best designs submitted by architects. In the result the design sent in by Messrs. Leeming & Leeming, of Westminster, was accepted, as we have already stated. The new market will be Renaissance in character, and cover an area of 3,000 square yards. With an elevation of 52 ft., the main frontage will be to Vicar-lane, where the street line is to be set back to make that thoroughfare 75 ft. wide. The ground thus lost by the widening of Vicar-lane will be made good by taking over a portion of the street which at present runs between the Kirkgate and the Wholesale Meat Markets. The length of frontage to Vicar-lane is to be 270 ft.; the new market will also front Kirkgate and Ludgate Hill, and the principal entrances will be at the junctions of Vicar-lane and Kirkgate and Vicar-lane and Ludgate-hill. A tower at each corner, as well as turrets and Mansard roofs, are to be features of the building, which is to be of stone externally, with glazed bricks inside. Facing the three streets alongside of the structure are to be twenty-three shops, while within the market hall itself (which will be 243 ft. long and 102 ft. wide) are to be as many as eighty-six places of business, one-half of which will be on a balcony approached by stairs from the main area. In addition to these places of business, there are to be eighty-four open stalls around the market, a feature of which will be the grouping of a number of them under the central dome around an ornamental clock stand in the middle of the market.

PROPOSED THEATRE FOR BOLTON.—Plans of a new theatre for Bolton have been prepared by Mr. W. G. R. Sprague, of London, and the Streets Committee have approved of these.

BUILDING IN SHEFFIELD IN 1899.—Building has been going on rapidly in Sheffield throughout 1899. Everywhere, on the fringe of the city, houses are springing up. The building boom of the last few years shows no sign of decreasing, nor will it until the conditions which produce it decrease. So long as the population goes up by leaps and bounds, so long will the network of Sheffield's streets extend its ramifications, with the speed and intricacy of a cobweb. Since 1891 the city's population is estimated to have increased from 324,291 to something like 361,169; and about 10,000 houses were erected between that year and last June. The past year has seen another remarkable increase in house-building. In considering its causes, we must remember, beside the constant clamour for more house room, the special stimulus given to building by the extension of the tramway system. Along all the new routes houses have sprung up, or are being built, wherever land is available; and in many cases the builders have anticipated the demand by erecting new houses where new lines are only projected. The statistics prepared in the City Surveyor's department give an excellent idea of building progress during the year. No less than 2,646 houses have been certified as fit for habitation within the city boundaries. In 1898 the total was 2,273. This shows the number of houses actually completed, but the figures of the builders' plans approved by the committee are quite as striking. The committee has sanctioned the erection of 3,618 houses, and 477 buildings of other kinds, and plans have been passed for making 77 new streets, covering about six miles in length. It will be seen from this that the new year will open with a great amount of house building in hand. Last year 3,560 houses and 458 other buildings were allowed by the committee, an increase of about 1½ per cent. on the total number. Altogether, the committee have considered no less than 1,057 plans for houses and 60 for new streets, and passed nearly 90 per cent. of them. These figures vividly illustrate the heavy and important labours of the sub-committee by whom the plans are examined. The record number of plans dealt with at one meeting was 92, and the average works out to 60, whilst in 1898 the average was only 50. It is significant of the rapidity with which housebuilding is taking place that the committee have sanctioned plans providing for as many as 80 and 120 houses at one swoop. Since the by-laws were adopted in 1864 there have been 34,000 houses erected in Sheffield. This gives an average of 970 new houses every year. One result of this steady growth in building within the last few years has been to greatly increase the work of the Corporation officials charged with the complex task of enforcing the by-laws. Municipal sanction is required for every erection, of whatever kind; but this formality is the least exacting part of the business. Each building in course of construction is supervised in all its stages by the Corporation building inspectors, whose department is one of the busiest of those under the City Surveyor. Until this year there were only four inspectors, but this number was long recognised as hopelessly insufficient to cope properly with the work. Thinking that the healthy activity of the building trade might turn out to be merely an ephemeral "boom," the committee at first hesitated to re-organise their staff. They have at length recognised that the increase is likely to be permanent; and have appointed four additional inspectors. The new Corporation Bill provides for yet more effective supervision of building by the municipality. Further powers still will, it is expected, be obtained through new by-laws. Most people admit that the present system is weak in many ways, and the public will welcome anything which gives the Corporation a tighter hand over the jerry-builder.—*Sheffield Independent.*

## *SANITARY AND ENGINEERING NEWS.*

ELECTRIC LIGHTING, OSWESTRY.—A Local Government Board inquiry was held at Oswestry on the 13th inst. by Mr. R. H. Bicknell, M.Inst.C.E., with reference to the application of the Town Council for sanction to borrow 18,000*l*. for the purchase of the electric light undertaking, and extension of the works and system. There was considerable opposition to the scheme, and counsel was engaged on both sides. Mr. W. C. Hawtayne, consulting engineer, M. Wilkinson, Engineer to the Eastbourne Electric Light Company, Mr. E. Bremner Smith, Engineer to the Oswestry Electric Light Company, and others gave evidence on behalf of the Council, and Mr. Hopkinson, electrical engineer, on behalf of the opposition.

ARDSLEY SEWAGE TREATMENT.—At a special meeting of the Ardsley Urban District Council, held on the 20th inst., it was decided to adopt a scheme for the bacterial treatment of the sewage of the Hoyle Mill and Measbro' Dike portion of their district. The scheme, which has been prepared by Mr. Theo. S. McCallum, of Manchester, provides

for pumping the sewage and then treating it in a series of septic tanks, and subsequently by a series of double contact bacteria beds. The sanction of the Local Government Board will be sought forthwith.

## *FOREIGN.*

FRANCE.—The Société des Artistes Français (the "Old Salon") has commissioned M. Thounny, architect, in place of M. Loviot, who has resigned, to design the building to be erected in the Avenue de Breteuil for the Salon of 1900. The new Salon has decided not to organise any exhibition for next year.——In spite of the veto of the "Vieux Paris" Committee, the Municipal Council of Paris has decided to carry out the additions to the Bourse, before described, according to the designs of M. Cavel.——There is to be a monument to Heine erected next year in the Montmartre cemetery. It is commissioned by the Empress Elizabeth of Austria from M. Hasselrie, sculptor, and is to consist of a marble bust of the poet, on a pedestal decorated with garlands of roses, laurels, and acanthus.——The Paris authorities are about to form two new squares, one in the Vaugirard quarter, the other on a site near the Jardin des Plantes, opposite the Boulangerie des Hôpitaux.——M. Formigé, the architect, has been commissioned to direct the works for the enlargement of the bridge of Suresnes, leading to the Bois de Boulogne. Each one of the piers is to be ornamented with decorative motives suggested by animal forms to be treated by M. Frémiet, the sculptor.——M. de Nolhac, the curator of the Versailles Museum, is at present engaged in arranging an interesting series of portraits of the sixteenth century, which will be placed in a suite of rooms in the north attic. This collection, which will include about 150 pictures by Clouet, will shortly be opened to the public.——The Mairie of Charenton is to be decorated by M. Georges Roussel, that of Bourg-la-Reine by M. Menu; and three ceilings in the Mairie of Asnières are to be painted by M. Courcelles-Dumont, a pupil of Elie Delaunay, and the completer of his work at the Panthéon.——M. Croiseau, architect, formerly head of the department of "Comptabilité des Travaux" in the Paris municipal service, has died at the age of eighty-two. He was one of the oldest and most zealous collaborators of Alphand; and previously to entering the service of the municipality he had been attached to the works of the Louvre additions, carried out under Visconti in the early portion of the reign of Napoléon III. He was father-in-law of M. Cavel, sectional architect to the municipality, and mentioned above as the architect for the additions to the Bourse. ——M. Clausade, sculptor, died the other day at the great exhibition works, from the effects of congestion of the lungs, brought on by cold. He was only thirty-five years of age. He was a pupil of Falguière, and had already been remarked for numerous works showing more than ordinary talent. He was author of the statue of Beaumarchais erected, as the result of a competition, in Rue St. Antoine, near the Place de la Bastille. Clausade was a native of Toulouse.

## *MISCELLANEOUS.*

THE CITY BUILDING COLLAPSE.—Dr. Wynn Westcott held an inquest on the 20th inst. at the Shoreditch Coroner's Court respecting the death of John Birch, thirty-nine, a labourer, of Southall, who was killed recently through the collapse of a building at Messrs. Phillips & Co.'s livery and bait establishment, 46, Worship-street, E.C. Mr. Lovegrove, District Surveyor, said the accident was caused by the subsidence of a pillar. The trench had been dug in a line with the columns instead of 5 ft. away, according to the plans. He was of opinion that the workmen engaged had cut away some portion of the concrete forming the base of the column, causing it to slide eastwards and collapse. The jury returned a verdict of "Accidental death," adding as a rider that they were unable to ascribe blame to any particular person. They were of opinion, however, that the collapse was due to the cutting away of the concrete foundation of the pillar.

EXTENSION OF EUSTON STATION.—It was reported at St. Pancras Vestry's meeting on the 20th inst. that the London and North-Western Railway Company had deposited plans with the vestry's Surveyor relating to a scheme for which Parliamentary sanction would be sought next session, for extending Euston Station, so that it might front on Euston-square. To this end it would be necessary to close those portions of the carriage-ways of Drummond-street, Euston-street, and Euston-square, situate between Seymour-street and Melton-street; also to close Seymour-row, Melton-mews, Euston-place, Euston-grove, and Euston-crescent; and further, to close the portion of Mornington-road, between Stanhope-street and Serpentine-road. It was proposed to form a new road in lieu of the latter, and also to construct an additional tunnel across the western end of Park-street by Stanhope-terrace, Regent's-park. The Vestry Surveyor (Mr. Blair, C.E.) was directed to report on the scheme.

BARRY BUILDERS' DINNER.—The annual dinner of the Barry Master Builders' Association was held on Tuesday last week, at the "Windsor Hotel," Barry Dock. Mr. S. Hopkins, the President, occupied the chair. The toast of "The Association" was given by Mr. W. E. Knapman, who said they had settled several local disputes amicably. The President, in response, said he hoped that the difficulties that threatened on account of the receipt of notices from the workmen for increased wages and shorter working hours would be satisfactorily overcome. Mr. Rendell, the Vice-President, also responded. Other toasts included "The Town and Trade," "The Barry Railway Company," and "The Public Bodies."

TRADES TRAINING SCHOOL.—The annual distribution of prizes to the successful students at the Trades Training School, Great Titchfield-street, which is conducted by the Carpenters' Company and other City Guilds associated with the building trade, took place on the 20th inst. at Carpenters' Hall, London Wall. Mr. Arthur Jacob (Master of the Carpenters' Company) occupied the chair. Professor T. Roger Smith, Chairman of the Joint Committee, stated that the individual students attending the school during the year numbered 309. This was the largest number that they had yet had, and was almost more than could be properly accommodated on the premises. Professor W. C. Unwin distributed the prizes. At the same time he presented the certificates and medals gained at the Carpenters' Company's examinations in sanitary building construction, and in carpentry, and in the architectural and building construction classes at King's College, with regard to which a special report was read by Mr. Stanton W. Preston (clerk to the Carpenters' Company). Professor Unwin congratulated the successful students on having fitted themselves to face the problems of industrial life, and said that London was better off by something having been added to the capabilities of its workmen. The Great Titchfield-street School filled the gap between the technical school and the workshop, and he thought that the Carpenters' Company and the other City Companies concerned deserved great credit for providing the 1,600*l.* per annum required to carry on the work there.

CARDIFF MASTER BUILDERS.—The annual dinner of the Cardiff Master Builders' Association was held at the Royal Hotel on Tuesday last week. Mr. H. E. Lattey (the President) occupied the chair, and he was supported by about seventy members and friends. The loyal toasts were submitted by the President. Mr. D. W. Davies gave the "Army and Navy," the toast being acknowledged by Major E. M. Bruce-Vaughan and Major C. B. Fowler. Mr. J. E. Turner, an ex-President, proposed "The Architects and Surveyors," Mr. Edwin Seward and Mr. E. H. Fawkner responding. Other toasts were spoken to by Mr. Lewis Williams, J.P., Mr. J. S. Chubb, Mr. John Williams, Mr. George Thomas, Mr. F. H. A. Lattey, Mr. G. Cousins, Mr. W. T. Morgan, Mr. F. A. Gowlin (Newport), Mr. John Gibson, and Mr. W. H. Inglison.

CRYSTAL PALACE ENGINEERING SCHOOL.—At the conclusion of the past term, the certificates gained by the students were distributed on Thursday, the 21st inst., in the lecture-room of the school at the Crystal Palace, by M. William Tregarthen Douglass, M.Inst.C.E., late Consulting Engineer to the Trinity House. The reports of the examiners, who were Messrs. J. Patten Barber, M.Inst.C.E., F. D. Workman, A.M.Inst.C.E., and Ch. Capito, M.Inst.E.E., were read, and an address was delivered by Mr. Douglass, who referred to the value of the work which was being carried out in the different sections of the School, Mr. Schenk, the Chairman of the Company, subsequently expressed the thanks of the directors to the examiner and to Mr. Douglass for the valuable services which they had so cordially rendered to the school on this occasion. After a short address by the Principal of the School, Mr. J. W. Wilson, A.M.Inst.C.E., the proceedings terminated.

BURLINGTON ARCADE.—An installation of electrical light has just been erected at the two fronts of Burlington Arcade, Piccadilly, by Messrs. T. Clarke & Son; the iron-work, which comprises wrought-iron swing brackets joined to standards of cast-iron, was executed by Messrs. Hart, Son, & Peard, of Drury-lane, after the designs of Mr. A. Baldwin Hayward. The Arcade was built in 1819, upon ground belonging to the Duke of Devonshire, from the plans and designs of Samuel Ware.

LORD'S CRICKET GROUND.—It is announced that the new tennis-court will be ready for use by members of the M.C.C. on January 1. The old tennis and racquet courts were pulled down a year ago to make room for the erection (by Messrs. J. Simpson & Son, contractors) of a lofty range of galleries and seats along the south and east sides of the ground, to accommodate nearly ten thousand spectators, together with dressing-rooms for the players and ground-bowlers. The new tennis and racquet courts have been built by Messrs. Walter Holt & Son, of Croydon, after the designs of, we learn, Messrs. N. S. Joseph, Son, & Smithem. They occupy the site of some former garden ground attached to No. 3, Grove End-road—"Duncroft House"—acquired by the Club in the winter of 1897-8, at the rear of the members' pavilion, which was designed by Thomas Verity, who died in May, 1891.

WINDOW, CASTLEFORD R.C. CHURCH.—A stained glass window has just been placed in St. Joseph's Roman Catholic Church, Castleford, Yorks, to commemorate the silver jubilee of the priesthood of the Rev. Father Hewison. The work represents our Saviour in the character of the Good Shepherd, and has been carried out by Messrs. Powell Bros., of Leeds.

THE BUILDING TRADE IN ABERDEEN IN 1899.—As already mentioned in the columns of the *Builder*, the boom in the building trade in Aberdeen has collapsed *pro tem.* During the year just closing, however, there have been passed by the Plans Committee of the Town Council the following plans:—343 new dwelling-houses of the value of 295,730*l.*; 124 alterations on houses and business premises, of the gross value of 48,532*l.*; thirty-four new business premises, value 59,200*l.*; eight public buildings, value 38,700*l.*; and 137 miscellaneous, value 6,850*l.* The principal buildings in course of construction have been—Granite works, Back Hilton-road; new hotel, Guild-street; bakery, George-street; granite works, Pitmuxton; warehouses, Torry; large warehouses, Huntly-street; additions to distillery, Hardgate; new comb works, Berryden; and Fish Market extension. Skene-square has been widened, and there have been erected Westfield Public School, Free Church at Beechgrove, additions at Royal Lunatic Asylum, Botanic Gardens Museum at Chanonry, public school at Mile-end, Stocket, and the Winter Garden at Duthie Park.

THE VALUE OF PROPERTY IN THE STRAND.—At the Guildhall, Westminster, on the 15th inst., Mr. Troutbeck and a special jury heard the case of Dyer's Trustees *v.* the London County Council, a claim for compensation in respect of the freehold interest in the premises, Nos. 283 and 284, Strand, and Nos. 44 and 45, Holywell-street, producing a total net rental of 500*l.* per annum. The property is required for the widening of the Strand at Holywell-street. Sir John Whittaker Ellis (Farebrother, Ellis, & Co.) stated that the property was very old, and would have had to be rebuilt at the expiration of the lease of No. 284 in thirteen years' time. The value of the claimants' interest in the property until the expiration of the lease was 5,000*l.* Upon rebuilding, the property would produce a ground rent of 873*l.* per annum, which, capitalised on the 3½ per cent. tables and deferred thirteen years, amounted to 16,587*l.* His total valuation, inclusive of the customary allowance of 10 per cent. for compulsory sale, was thus 23,745*l.* Mr. Daniel Watney (past President of the Surveyors' Institution) and Mr. Edward Holroyd Bousfield (Edwin Fox & Bousfield) gave confirmatory evidence. Counsel agreed that the value of the property until the expiration of the lease should be taken at 4,713*l.* On behalf of the London County Council, Mr. Edward Boyle then called Mr. Samuel Walker (Walker & Son), who estimated the total ground-rent to be obtained after rebuilding at 563*l.* per annum, and he capitalised it on the 4 per cent. table deferred (until the rebuilding) fourteen years, fourteen and a half years' purchase, 8,163*l.*, to which he added the agreed sum of 4,713*l.* and 10 per cent. for compulsory sale, making a total of 14,163*l.* The jury awarded the claimants 20,564*l.* and 10 per cent. for compulsory sale, 2,056*l.*, a total of 22,620*l.*

NEW POST-OFFICES.—A Bill will be introduced next session to empower the Postmaster-General to acquire certain properties for the postal service, consisting of the St. Mary Woolnoth rectory house, No. 86, King William-street, adjoining Post Office-court, Lombard-street; Nos. 116-8, with the gardens and premises at the rear of Nos. 113-4-4A, Upper-street, Islington, for the new Northern District Post-Office; Nos. 198-200-2-4, Whitechapel-road, with Nos. 15-7-23, Raven-row, and Nos. 1-10, Yoakley's-buildings, for an extension of the present office; Nos. 141-3-161, Union-street, Nos. 42 and 44, Orange-street, and Nos. 3, 3A, 4, 5, Pepper-street, Southwark, for a parcels office; Nos. 4 and 6, Foxberry-road, Bromley; vacant land at Cleveland-road, Ilford; the "Falcon" Inn, Flat-street, "Black Swan" Hotel, Pond-street, and five houses, Pond-street, Sheffield, adjoining the present office; a site at Canute-road, Southampton, situated within the London and South Western Railway Company's dock premises, for a head telegraph office; a block of premises at Bristol for a sorting-office; and premises adjoining Cecil-street post-office for the new chief post-office in Limerick.

GLASGOW ARCHÆOLOGICAL SOCIETY.—The monthly meeting of this Society was held on the 21st inst. at 207, Bath-street. A paper on "The Château of St. Fargeau" was read by Mr. Dalrymple Duncan, honorary secretary. Mr. Duncan described the château as little known to the traveller, and yet interesting, both architecturally and from the fact that during its entire history it has been its fortune to be the property of notable historical personages. The little town of St. Fargeau lies in the Puisaye, a district of forest-clad upland partly in the Department of the Yonne and partly in that of the Nievre. It contains an old church and several specimens of mediæval domestic architecture, but its most important feature is the château, a gloomy brick building of immense size, standing within a broad moat. A fortress has existed on the present site since the end of the tenth century, but the existing buildings date mainly from the sixteenth and seventeenth centuries.

GREAT YARMOUTH MASTER BUILDERS' ASSOCIATION.—The Great Yarmouth Master Builders Association held their second annual dinner at the

Duke's Head Hotel on the 21st inst., under the presidency of the Mayor (Mr. B. H. Press). Responding to the toast of "The Mayor and Corporation," the Mayor appealed for the assistance of the builders in carrying out the by-laws, which he stated would be to the benefit of the town and the benefit of the builders themselves. Dr. Ryley (Deputy Mayor) whose name was associated with the toast, said that at the present time there was no trade flourishing with greater activity and prosperity than the builders'. It was an easy thing to say, "Go and destroy the Rows," but it was a difficult matter to carry it out. There were plenty of houses that had been built, and had sunk into the earth, with the result that the drain pipes had cracked, and sewer gas had penetrated into the houses, He asked them to look well to the foundations. "Success to the Builders' Association" was given by the Mayor, who observed that, in view of the work contemplated by the Corporation, the builders were in for a good time. When he presided over the Sanitary Committee, which he did for seven years, he visited the Row districts on three different occasions with the Medical Officer of Health, the late Town Clerk, and the Inspector of Nuisances, and he was astonished at what he saw. Whether these properties had been pulled down or not, he could not say, but the condition in which he found them was such that they were not fit to lodge a pig in. Nothing could be done but to pull them down. Mr. Grimbley responded, and stated that the Corporation must not be surprised if some intelligent builders opposed some of the regulations laid down in the by-laws. "The Architects," proposed by Mr. W. Wright, was responded to by Messrs. Arnott, Teasdell, and Baker, all of whom spoke of the good feeling existing between the architects and the builders in the town. "The Visitors," proposed by Messrs. A. Davey and A. E. Bond, was responded to by Messrs. C. N. Brown and J. Tolver Waters.

## *LEGAL*

### IMPORTANT CASE UNDER THE LONDON BUILDING ACT, 1894.

JUDGMENT was given in the Queen's Bench Division in the case of Armstrong *v.* the London County Council on the 21st inst. The case was argued before a specially constituted court of three Judges, viz., the Lord Chief Justice and Justices Bigham and Darling, on the 17th ult. The matter came before the court in the form of a special case stated by Justices of London who had convicted the appellant on an information laid by the respondents, charging him with commencing to form and lay out a street for carriage traffic without first having obtained the sanction of the County Council, an alleged contravention of Section 7 of the London Building Act, 1894.

It appeared that the appellant owned a piece of land called the Cleveland Estate, adjoining the Grove, in the parish of St. Pancras. The land was bounded on one side by the Grove, which was a public carriageway, and on the opposite side by Parliament Hill, a public park. On the other sides it was bounded by land owned privately. The estate was upwards of three acres in size. In July, 1898, the appellant commenced to build on the land in accordance with plans deposited with the District Surveyor, he proposing to pull down some old buildings and erect twenty new buildings or blocks of flats, each block containing eight flats, of which sixteen blocks were to be erected in the form of a quadrangle with an ornamental garden in the centre. The approach to this quadrangle was to be by means of a carriage-way from the Grove, running round the garden, and bounded as to the part between the Grove and the garden by two more of the blocks on either side. Each block would have a separate entrance from the carriage-way, the approach from the Grove would be 40 ft. in width, and the total length of it would be 600 ft. The carriage-way was formed and sewered in all respects in the way in which the carriage-way of an ordinary street would be formed and sewered. The appellant did not intend to dedicate any right-of-way for the use of the public over the land; but he intended to erect gates at the entrance and to keep a porter there, and the carriage-way was intended for the use only of the tenants of the flats and persons visiting them, with or without carriages. Prior to the commencement of the buildings, an application was made to the Council for their sanction, accompanied by plans. These plans did not show any gates at the junction with the Grove, but showed a through communication with a footway upon Parliament Hill. The Council refused its sanction on the ground that the proposed street would not afford direct communication between two streets formed and laid out for carriage traffic. The Justices convicted the appellant and ordered him to pay a fine of 1*l.* and 5*l.* 5s. costs. Section 7 of the London Building Act, 1894, provides that before any person commences to form or lay out any street, whether intended to be used for carriage traffic or for foot traffic only, such persons shall make an application, accompanied by plans, to the Council for their sanction to the formation or laying out of such street. Section 9 of the Act provides that the Council may refuse such application where the proposed street will not afford direct communication between two streets, such two streets being (where it is intended to form or lay out such street for carriage traffic) streets formed and laid out for carriage traffic.

Mr. Macmorran, Q.C., and Mr. R. C. Glen appeared for the appellant; and Mr. Horace Avory and Mr. Daldy for the respondents.

Mr. Macmorran contended that the carriage-way was not a street within the meaning of Section 7 of the Act, nor was it laid out for carriage traffic. It might be a street for certain purposes, but it was not a street within the section because it was not intended for public carriage traffic. Public traffic was what was contemplated by the section, not private traffic. A carriage-way to a private house was obviously not intended to be touched by the section. His submission was that the conviction was wrong.

Mr. Avory, in support of the conviction, said there was evidence that the carriage-way was a street. The fact that the carriage-way was not open to the public, but closed by a gate did not prevent its being a street. It might be a street though closed to the public. The section included a street laid out for any sort of carriage traffic, public or private, assuming that the carriage-way was a street in other respects.

The Lord Chief Justice, who read the judgment of the Court, said the question to be determined was whether the carriage-way proposed to be formed by the appellant would, when formed, be a street within the meaning of Section 7 of the London Building Act, 1894. It seemed desirable before considering the sections of the Act which applied to this particular case to notice the general scope of the Act. It involved a large measure of interference with the rights of private owners; they could not do what they liked with their property. They could not make or even widen streets except in conformity with the provisions of the Act. They must observe certain lines of building frontage. They must have a certain specified space at the rear of the domestic buildings they erected. The buildings constructed must be built in conformity with certain detailed requirements as to height, thickness of walls, &c. It was clear, therefore, that this legislation materially interfered with the action of owners in the use and disposition of their property, and it must be assumed that this had been permitted by the Legislature for reasons of public policy affecting the health, safety, and convenience of the public. His Lordship said the question in the case turned upon whether the way, which the appellant had commenced to lay out and form, would be a "street" within the meaning of Section 7 of the Act. Unless the context otherwise required, Section 5 (the interpretation section) showed the wide meaning to be given to the word "street." It meant and included highway, road, bridge, lane, mews, footway, square, court, alley, passage (whether a thoroughfare or not), and also a part of any of those. No description could be wider. Why, then, was the contemplated way not a street? It was not the less a street because after proceeding straight for a certain distance, it was continued inside or around the proposed square, for "square" was expressly mentioned in the interpretation section. It was clear it was not less a street because it was intended to be used as a private way, for the interpretation section in no way so limited "street." It was clear from the wording of the interpretation section that the traffic there mentioned included both public and private traffic, for there was no trace of any intended limitation to the former of these. It did not follow that everything enumerated in the interpretation clause was a street for all purposes, and in all circumstances within the meaning of the Act. There was involved in the idea of "street" the presence of houses or buildings more or less continuous and in greater or less proximity to one another along it. Taking the broad description of what a street is as expressed in the judgment in the case of Regina *v.* Fulford, the Court thought that what the appellant began to lay out was a street within the meaning of Section 7 of the Act, and as he did so without having obtained the sanction of the respondents he committed the offence of which he had been convicted. The court thought that the magistrates would have decided wrongly had they decided differently. The appeal would therefore be dismissed with costs.

### WHAT IS "EXTERNAL PAINTING"?

IN the City of London Court, on Tuesday last week, before Mr. Commissioner Kerr, the Estates and Investment Corporation, Limited, 8, Great Winchester-street, E.C., sued Messrs. W. Grantham & Sons, Dean-street, Fetter-lane, E.C., house decorators, to recover the sum of 13*l.* 8s. 2d. as damages for breach of a contract to paint certain houses. The case raised the question as to what was understood by the "external painting" of houses. Mr. Fisher appeared for the plaintiffs, and Mr. Magee for the defendants.—The plaintiffs, it appeared, owned a lot of property at Bush Hill-lane, and their case was that they employed the defendants to paint the outsides of forty-five houses. The defendants undertook the work, but they did it so badly, according to the plaintiff's assertions, that it was found necessary to do the work over again. This had entailed on the plaintiffs an expenditure of the sum now sued for which they claimed by way of damages for breach of contract.—Mr. Fisher said the case had been before the Court on a previous occasion, when they were non-suited because the estimate under which the work was done was not stamped. They had had the document stamped, and they had paid a penalty of 5s. only. His present opinion was still that the document did not require stamping. Mr. Commissioner Kerr said that the estimate was a contract, and therefore it should have been stamped in the first instance. It was not his fault that the Legislature insisted on contracts being stamped; but it was his fault if such documents were used in evidence without showing that the necessary stamp had been affixed.—Mr. Magee, in answer to the Judge, said the defence was two-fold. They were supposed to have damaged a number of slates, but they had not done anything of the sort. One of the contentions of the plaintiffs was that they ought to have painted the insides of the gutters of the various houses. Their answer to that was that it was not contemplated by the contract; and therefore there was no breach. It never was done.—Mr. Fisher said the defendants were employed to paint "all external work," and the estimate also stipulated that the gutters and stackpipes should be painted with one coat in oil. The defendants had omitted to paint the insides of the gutters or inside the stackpipes. The defendants had not only omitted to paint the gutters, but in some places, when the work was outside the line of vision, that was not painted at all. The reason the plaintiffs wanted the gutters painted inside as well as out was not for decorative purposes only, but to protect the property. Mr. Kellett, surveyor, Great Winchester-street, said he was employed by the plaintiffs to see that their property was properly repaired and decorated. The defendants were entrusted with forty-five houses to paint, but none of the insides of the gutters had been touched. They should have been cleaned out thoroughly at first, and then painted. It was certainly the custom of the trade, so far as he understood it, for gutters to be always painted on the insides as well as out. While the defendants' men were engaged upon the roofs they had broken 191 slates. The prices now charged for doing the work properly were quite low trade prices. In cross-examination witness said he had had ten years' experience in the building trade; and, in his opinion, it was never customary not to paint the insides of gutters. He did not agree that it was quite as customary to paint the insides of stackpipes; but it was frequently done, a long stick being used for the purpose. He did not know that other men were also employed on the roofs of the various houses or that the slates became broken in that way. Other firms were employed to do the painting before the defendants took it up, the previous people's contract having been put an end to. Mr. Lee, manager of the plaintiff's property at Bush Hill Park, corroborated the last witness about the gutters not being painted, and that it was customary in the trade to do so. Mr. John Farren, architect and surveyor, Coleman-street, said he was acting for two insurance companies and one or two land companies and had been in business for thirty years. When external painting was ordered it was always understood that the insides as well as the outsides should be painted. He confessed, if he had been making the contract sued upon, he should have stated so definitely, and not left it to uncertainty.—Mr. Commissioner Kerr said he had noticed among the letters one in which it was stated that the majority of speculative builders omitted to paint the inside of gutters.—Mr. Magee said it was not the custom at all to paint the insides. He had a considerable body of evidence in Court to show that.—Mr. Commissioner Kerr said he had endeavoured to persuade the parties to refer the matter for decision to a surveyor. That could only be done by consent. As the parties would not consent he should refer the case to a jury. The plaintiffs, no doubt, could prove the custom was not to paint the insides of the gutters, while the defendants would probably call an equally strong body of witnesses who would show conclusively that that was not the custom. A jury was the proper tribunal to determine such a dispute; and the case was adjourned for that purpose.

## MEETINGS.

WEDNESDAY, JANUARY 3.

*Builders' Foremen and Clerks of Works' Institution.*—Ordinary meeting of the members. 8 p.m.

THURSDAY, JANUARY 4.

*Civil and Mechanical Engineers' Society.*—Mr. W. A. Francken on "Well Foundations in India." 8 p.m.

SATURDAY, JANUARY 6.

*British Institute of Certified Carpenters (Carpenters' Hall).* 6 p.m.

## RECENT PATENTS:

ACCEPTED SPECIFICATIONS.

*Open to Opposition until February 20.*

[1898]. 23,973, Putz, Pantographical or similar Apparatus. 26,254, Sieverts, Mantles, &c., for Lighting Purposes. 26,558, Montgomery-Moore & Preston, Closing

# COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

## COMPETITIONS.

| Nature of Work. | By whom Advertised. | Premiums. | Designs to be delivered. |
|---|---|---|---|
| *Drawings and Designs for Proposed Church and Vicarage | Barnsley Corp. | 50 gns.; 30 gns. and 20 gns. | Feb. 12 |

## CONTRACTS.

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| Settling Tank, Neepsend Station | Sheffield Gas Co. | J. W. Morrison, Engr. Commercial-st. Sheffield | Jan. 2 |
| Warehouse, Victoria Mills, Bradford | | S. Jackson & Son, Archt. Tanfield Chambers, Bradford | do. |
| Granite (1,000 tons) | Southampton Corp. | W. B. G. Bennett, Engr. Municipal Offices | do. |
| Alterations, &c. Whitevale Depot | Glasgow Corp. | J. Young, 88, Renfield-st. Glasgow | do. |
| Alterations, &c. to Hotel, Bondgate, Darlington | Plews & Sons | G. Dickinson & Son, Archt. 5, Houndgate, Darlington | do. |
| Three Shops and House, Ashton-under-Lyne | | George & Son, Old-square, Ashton-under-Lyne | do. |
| Road Works, Cargate Grove | Aldershot U.D.C. | N. F. Dennis, Surv. Aldershot | do. |
| *Construction of Underground Conveniences | Bromley U.D.C. | Surv. Council Offices, Bromley, Kent | do. |
| Esplanade Works | Littlehampton U.D.C. | H. Howard, Surv. Town Offices, Littlehampton | Jan. 3 |
| Hospital, Cilybebyll | Pontardawe Hospital Committee | J. Morgan, Surv. Herbert Chmbrs. Pontardawe | do. |
| Sewering, &c. Servia-road | Litherland (Lancs.) U.D.C. | W. B. Garton, Surv. 25, Sefton-rd. Litherland | do. |
| Drain Pipes, Port View | Saltash U.D.C. | R. H. Worth, C.E. 42, George-st. Plymouth | do. |
| Paving Leith Walk | Leith (N.B.) T.C. | Burgh Surv. Town Hall | do. |
| Road Metal, &c. | Annan (N.B.) Commrs. | A. Tweedie, Surv. Annan | do. |
| Flagging and Sewering | Birkenhead Corp. | C. Brownridge, C.E. Town Hall | do. |
| Sewerage Works, Pelton | Chester-le-Street R.D.C. | J. H. Mole, Surv. Council Offices | do. |
| Road Works | Erdington U.D.C. | H. H. Humphries, Engr. Public Hall, Erdington | do. |
| *Work in Connexion with the Erection of New Engine House | Shoreditch Vestry | C. N. Russell, Ligoting Station, Coronet-st. N. | do. |
| Two Semi-detached and Four Other Houses, Bridlington Quay | A. G. W. Wright | J. Earnshaw, Archt. Carlton House, Bridlington Quay | Jan. 4 |
| Electric Plant | Bedford Corp. | T. S. Porter, Town Hall, Bedford | Jan. 5 |
| Sewer | Cheltenham Corp. | Borough Surv. Municipal Offices | Jan. 6 |
| Paving Works | Halifax Corp. | E. R. S. Escott, C.E. Town Hall | do. |
| Reservoir, &c. | Roscommon D.C. | C. Mulvany, C.E. Roscommon | do. |
| Cast Iron Pipes (1,050 yards) | Calne T.C. | W. H. Stanley, C.E. Market House Chmbrs. Trowbridge | do. |
| Waterworks | do. | do. | do. |
| Granite | Croydon Union | H. List, Union Offices, Mayday-rd. Croydon | Jan 8 |
| Waterworks | Abergavenny R.D.C. | J. Gill, Surv. Merthyr-rd. Abergavenny | do. |
| Reservoir | Abingdon R.D.C. | G. Wiltship, C.E. Borough Buildings | do. |
| School, Blaentylery, Mon. | Aberystruth Sch. Bd. | R. L. Roberts, Archt. Victoria-chmbrs. Abercarn | do. |
| Steel Gasholder | Clacton-on-Sea U.D.C. | S. Francis, Engr. Town Hall, Clacton | do. |
| Sewerage Works at Asylum, Waterford | | G. J. Briscoe, Asylum Office, Waterford | do. |
| Bandstand, &c. Grand Parade | Eastbourne T.C. | R. M. Gloyne, C.E. Town Hall | do. |
| *Extension of Market Buildings | Boro. of Oswestry | G. W. Lacey, Guildhall, Oswestry | do. |

## CONTRACTS—*Continued.*

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| Schools, Sandfield | Guildford Sch. Bd. | A. J. Sturges, 25, High-st. Guildford | Jan. 13 |
| Restoration of Bawtry Church, Yorks. | | C. H. Fowler, Archt. The College, Durham | do. |
| *Enlargement of Electric Lighting Station | Boro. of Tunbridge Wells | W. C. Cripps, Town Hall, Tunbridge Wells | Jan. 15 |
| Additions to Workhouse | Grimsby Union | H. C. Scaping, Courtchmbrs. Gt Grimsby | do. |
| Iron Girder Bridge over River Gwili | Carmarthen R.D.C. | R. Browne, 7, Hall-street, Carmarthen | do. |
| *Erection of Generating Station | Aberystwyth, &c. Corp | Kincaid, Waller, & Manville, 29, Gt. George-st. Westminster | do. |
| *Erection of Warehouse | | Goff & Co. 83, Long Acre, W.C. | do. |
| *Erection of School Buildings | Oxford Sch. Bd. | F. P. Morrell, 1, St. Giles', Oxford | do. |
| *Constructing, &c. Sewers | Paddington Vestry | Surv. Office Vestry Hall, Harrow-road, W. | do. |
| Police Station, &c. Chadderton, near Oldham | Lancs. Standing Joint Com. | H. Littler, Archt. County Offices, Preston | Jan. 16 |
| *Foundations, &c. for New Infirmary | Willesden Gdn | A. S. Snell, 23 Southampton-bldgs. Chancery-lane, W.C. | Jan. 17 |
| *Carrying-out Works of Sewerage | Isle of Thanet R.D.C. | A. Latham, Municipal Bldgs. Margate | Jan. 18 |
| *Construction of Underground Conveniences | Cnty. Boro. of Brighton | F. J. C. May, Town Hall, Brighton | Jan. 19 |
| Iron Bridge, near Ramsgate | | W. A. Valon, Hardres-st. Ramsgate | do. |
| New Road, near Stourmouth | | L. W. Hogbin, Birchington | do. |
| *Erection of Hospital | Stourbridge and Halesowen Hosp Com. | A. T. Butler, High-street, Cradley Heath | do. |
| Railway Quay, Oban | Callander & Oban Ry. Co. | T. M. Barr, Engr. Perth | Jan. 20 |
| *Erection of Nurses' Home, &c. | Sheffield Union | Union Offices, Westbar, Sheffield | do. |
| *Construction of Sewers | Uxbridge R.D.C. | J. Austie, 10, Marchwood-crescent, Ealing | Jan. 22 |
| *Public Lavatories, &c | Lewisham B. of W. | Surv. Dept. Lewisham Town Hall, Catford, S.E. | Jan. 23 |
| *Supply and Fixing of Boilers, &c. | Hastings Union | Jeffery & Skiller, 5, Havelock-rd. Hastings | Jan. 25 |
| Sewerage Works, Selston | Kirkby-in-Ashfield U.D.C. | H. Silcock, 14, Westgate, Mansfield | Jan. 27 |
| *Reconstruction of Two Bridges | Hursley R.D.C. | Lemon & Blizard, Lansdowne House, Castle-lane, Southampton | do. |
| Schools, Chester-rd. Bishop Wearmouth | Sunderland Sch. Bd. | T. W. Bryers, 15, John-st. Sunderland | Jan. 29 |
| Four Houses and Shops, Jack-lane, Hunslet | J. Hollings | W. M. Ingoldill, Archt. Beech-grove, Stourton | No date |
| Slating Church, New Shoreham | | F. C. Pilmore, 3, Western-rd. New Shoreham | do. |
| Sewerage Works, Hampton | | G. O. Ballard, Hampton-on-the-Hill | do. |
| Road Metal, &c. | Cockermouth R.D.C. | J. B. Wilson, C.E. Courtbuildings, Cockermouth | do. |
| Seven Houses, Burnley-rd. Padiham, Burnley | | Hitchon & Pritchard, 48, Manchester-rd. Burnley | do. |

## PUBLIC APPOINTMENTS.

| Nature of Appointment. | By whom Advertised | Salary. | Application to be in. |
|---|---|---|---|
| *Quantity Surveyor | Vestry of Fulham | | Jan. 6 |
| *Draughtsman and Measurer | East Ham U.D.C. | 180*l.* rising 250*l.* | Jan. 9 |
| *Deputy Surveyor | County Boro. of St. Helens | 160*l.* per year | Jan. 10 |
| *Architectural Assistant | Cnty. Boro. of Cardiff | 2*l.* 7*s.* 6*d.* per week | do. |

*Those marked with an asterisk (*) are advertised in this Number.* *Competitions, p.* iv. *Contracts, pp.* iv. vi. viii. x. & xvi. *Public Appointments, pp.* xvi. & xviii.

and Opening Bulkhead and other Doors. 26,570, Labram, Braking Apparatus for Trucks, Waggons, Tubs, &c., on Rails or Tramways. 26,610, Crompton & Pochin, Arc Lamps. 26,628, Goodwin, and [1899] 4,054, de Lasserve, Acetylene Gas Generators. 26,713, Walson, Durell, & Miller, Water-closet Valves. 26,902, Paryczko & Litynski, Heating the Contents of Baths, &c. 27,086, Dickson, Vacuum Pumps. 27,193, Bierenz, Reproduction of Drawings, &c. 27,220, Ferguson, Bins or Receptacles for holding Household Ashes or other Refuse and Mode of emptying Them. 27,556, Bottelli, Incandescent Electrical Lamps. [1899] 630, Edwards, Pumps. 754, Jackson & Withington, Door Fastenings. 825, Harris, Electrical Measuring Instruments. 982, Gorringe, Stoppering Varnish, Oil, Paint Cans, &c. 1,184, Hitchcox, Dust Cover and Shoot for a Cart or Waggon to avoid Dissemination in the Removal of House and other Refuse. 1,739, Prestor & Ballett, Grease Traps. 1,869, Orling & Braunerhjelm, Electrical Condenser and Apparatus for producing powerful Electrical Waves. 1,877, de Visser, Means of preventing the Formation of Boiler Incrustations. 2,139, Squire & Squire, Swing Joint or Movement for Windows, Ventilators, &c. 2,318, Irwin & Leather, Extraction of Naphthalene from Coal Gas. 2,413, Binny, Swing Radiators. 2,434, J. Duckett & Son & Duckett, Gulleys or Traps for Downspouts. 2,757, Restall, Apparatus for Jointing and Repairing Drain and other Pipes. 2,930, May, Means for Consuming Smoke. 3,096, Crompton & Chambers, Collapsible Core Bars for Use in casting Metal Pipes, Columns, &c. 3,120, Baildon, Punkahs. 3,160, Smithson & Sharpe, Electro-Magnetical Cut-outs, &c., for Arc Lamps. 3,197, Railton, Campbell, & Railton, Ash and other Hoists. 3,333, Tattersall, Ventilating Fans. 3,337, Purdy & Hindley & Co., Road Paving. 3,460, Morris, Cutting Tiles, &c. 3,475, de Bechi, Zinc Oxide. 3,522, Freeman & Old, Line Attachment for Window and other Frames. 3,903, Pilkington, Machinery for Rolling Sheets of Glass. 3,970, Detsinyi, a Method of Heating. 5,408, Green, Chimney-tops for preventing Down-draught. 9,147, Green, Supporting and Liberating Pit-props. 13,674, de Schodt, Apparatus for Use in Incandescent Gas Lighting and Heating. 13,911, Stevensen, Combination Latch and Alarm Lock. 14,816, Bayley, Acetylene Lamps. 14,948, Shaw, Gas Lamps and Lanterns. 17,830, Fairbairn, Greenhouses and Similar Structures. 18,241, Cervenka, Incandescent Gas Lamps and Burners. 18,262, Förster, Tube, Pipe, and Similar Castings. 18,516, Fülöph & Lackovie, Blasting Composition. 18,787, Artificial Stone. 18,945, Gruendler, Tiled Boards or Blocks for Floors, Ceilings, &c. 18,946, La Veine, Spring Clamps. 19,458, Garretson & Browne, Cribs or Caissons for Docks, &c. 20,423, Murinick, Incandescent Gas Burner. 20,471, Delason, Electrical Batteries. 20,507, von Arnswaldt, Electrical Gas-igniter. 20,743, Rissler & Bauer, Electricity Meters. 20,930, de Bruyn, Artificial Building Stone. 21,205, Kettler, Wrenches. 21,401, Schmidt, Joiners' Clamps. 21,936, Birkery & Standish, Tank Outlet Valves. 21,963, Fink, Building Blocks for Cavity Walls. 22,415, Sterkel, Brushes. 22,467, Cohen, Mouldings. 22,533, Steinmetz, Systems of Electrical Distribution. 22,536, Oxley, Electrical Circuit Changers. 22,547, Arledter & Huth, Resin, Size, &c. 22,626, Hopkins, Breakwaters, River Bank Facings or Protections, &c. 22,637, Hatton & Guernsey, Wrench or Spanner. 22,666, Anderson, Chemical Generator of Electricity. 22,671, Adams, Seat-action Closets. 22,722, Kessel, Gas Stoves. 22,748, Thosehrn, Screw-jacks. 22,884, Kemnitz, Construction of Ceilings and Walls for Buildings and other Structures. 22,890, Barth, Collapsible or Folding Ladders. 22,903, Cerebotani & Moradelli, Pawl and Ratchet-feed mechanism.

### ABSTRACTS OF PATENTED INVENTIONS.

18,302.—ARTIFICIAL ASPHALT: *J. W. Hayward.*—An admixture of petroleum residue and ground limestone is exposed to the oxidising influence of the air, or of ozonised air, ozone, or oxygen, and then put into a heated retort that turns upon a fixed tubular shaft blocked at one end with a plug, wherein air is forced through branch pipes into the material. Before it is mixed with the limestone the petroleum residue may be oxidised.

18,305.—TRIMMING-UP SIDES OF ROADS: *A. Boudieu.*—The apparatus, to be drawn by animal power, comprises a set of ploughshares set parallel-wise, and rendered adjustable with screws, the carriers being raised, when necessary, in sockets between parallel cross-beams bolted together. A knife, projecting obliquely, is mounted similarly at the rear. For lifting the back of the machine an arm, with lever and links, is provided, and a screw serves for lifting the front, so that all the shares may be withdrawn at once. For cutting turf, knives are substituted for the shares.

18,328.—GAS AND OTHER METERS: *E. Rhodes.*—Plunger rods are joined to two points of a three-sided frame, whilst the third point is attached to the crank of an indicator driving-shaft, the frame being pivotted to a balanced link framing. The plunger rods are arranged so that their positions may differ by half their motion.

18,331.—WINDOW SASHES: *A. Leaver & T. King.*—Springs in metal cases or boxes let into the frame force rollers against the stiles in order that the sashes may be retained in any position desired, the springs pressing upon the shoulders of brackets that carry the rollers. When the sash is raised the roller can revolve in one direction, but the engagement of a pin with a ratchet wheel prevents it from turning in the opposite direction when the sash is freed. For locking the sashes, when either closed or opened, is devised the action of a spring which forces a roller, carried upon a rod that passes through the lower sash into one of a series of recesses formed in the upper sash. When the rod is pulled backwards through a right angle, the roller is placed out of action, and a protecting plate of the metal case holds a cross-bar of the rod in position.

18,388.—AN HYDRAULIC HOSE JOINT: *F. Reddaway & Co. and J. Muskett.*—An expansion joint, intended to take up shocks in hose that conveys pressure to percussive tools, hydraulic rivetters, and so on, is made of a tube, having a fixed collar or piston, applied at one end of the tool or hose, enveloped in a casing which contains a spiral spring. A joint with the tube is formed with the union of the next length of hose screwed into the casing by means of a cup-leather, so that the spiral spring controls the telescopical movement of the tube in its casing by taking up the shock due to sudden changes in the pressure.

18,436.—ACETYLENE GAS: *G. Matthyssens.*—Four carbide holders having perforated sides and gas bell covers are put inside four compartments of a casing. Each bell is perforated near its base for passage of water, has an air escape valve, and is made with double walls which form outside water receptacles for cooling the gas inside of the generators, which are used in pairs. The second pair can be cleaned whilst water is being admitted into the other pair. An overflow pipe prevents water from running into the gas outlet pipes; as the gas-holder falls, water is admitted automatically from a tank through a joint between the holder and a weighted lever, which, when rising, lowers a caoutchouc tube's outlet. As the bell rises, the lever falls so as to free the tube's outlet; the holder opens a safety

escape-cock when it rises above the normal height. The gas from the holder passes through a drying and purifying chamber divided into two sections, and the bell of the gas-holder has a capacity that will contain all the gas produced in that part of it which is above the level at which the water supply is turned on.

18,446.—COUPLINGS AND JOINTS FOR PIPES AND TUBES, VALVES, &c.: *R. Krix & F. Korwill.*—For a pressure-reducing and filtering valve, which will also cut off the water automatically when one pipe of the joint is taken away, and will prevent back flow of water to the joint's other pipe, is contrived a cylindrically-shaped body placed within the metal union, within which body are arranged layers of filtering material, and on its side a star-shaped valve head, a closing disc made of indiarubber, and a strengthening metallic disc, all of which are held together and on to a cross-piece with a screw and its nuts.

18,451.—SPANNERS: *J. E. Meredith.*—In one form the spanner has at one end a loop in two parts, which can be passed over a nut and be then closed together by passing a pin through holes in their ends. In another form the loop is entire, its two faces gripping the nut, which is also held by the cam-shaped end of the lever to which the loop is pivotted. The lever may either receive a third arm on the loop through a slot at its end, or have a U-section.

18,475.—ELECTRICITY METERS: *T. A. Edison.*—The inner electrodes of two cells are mounted, with ivory insulating rings and knife-edges, on the ends of the beam of a registering electrolytic meter, the beam being carried upon knife-edges and furnished with a weighted arm; for centering purposes there are rods which hold the outer electrodes clear from the containing jars, and are joined together; as the two cells are used in series, one inner electrode becomes lighter as the other becomes heavier, and the beam shifts accordingly until its finger sets free one of two arms of the escapement of a weight-driven counter, whilst it engages with the other arm; at the same time a forked switch arm is rocked by the escapement shaft's crank, whereupon, as the switch moves from one of two contact springs to the other, the current through the two cells becomes reversed; a parallel resistance is provided for the main circuit through the meter, half of it being employed at any one time; the movable electrodes are joined to the switch arm and to the middle of the main resistance, respectively, the two springs are joined to the main resistance ends, surface contacts are avoided by using flexible non-elastic metal strips for the connexions with the switch arms and the moveable electrodes. To prevent leakage from the glass jars, should they become cracked, an external coating of amyl-acetate collodion is applied to them by a course of repeated dipping and drying, and a same coating is applied to the supporting wires of the electrodes; when the temperature approaches freezing point a lamp is connected between the mains by maans of a thermostatical strip. If it be desired to measure alternating current by the meter described, the current is made to pass through a resistance strip, whose cross-section is reduced at the length where it is attached to a thermopilé, supplied with end and middle connexions, so that a proportional continuous current may be secured in either direction for the electrolytical cells.

18,487.—LEADEN PLATES FOR ACCUMULATORS, &c.: *R. Berks, von Ritter, & J. Renger.*—The plates are fashioned by ejecting lead, in an almost molten state, through the apertures of a mould which are so made that one set of strips will fall out more quickly than the other set will, whilst the latter are drawn upwards by means of an ordinary tension contrivance. The first-named set of strips unite with the others, and so form a plate consisting of straight strips interchanged with S-shaped, or waved, strips.

18,514.—A REGENERATIVE GAS LAMP: *W. G. Potter.*—A coiled tube is placed near the flame in order to heat the gas that passes through it. The gas is regulated with a by-pass, or other kind of tap, as well as by adjustment of the cone-shaped upper ends of the burner. A chamber is supplied for heating the central air current, which also is regulated by an adjustment of the upper one of two flame-spreading discs, between which it passes on its way to the flame, whilst another current of warm air flows between the inner and outer walls of the upper cylinder-shaped portion of the chimney.

18,523.—VALVE DISCHARGE, SIPHONS, AND BALL AND FLOAT VALVES: *J. Shanks.*—The valve and its float slide freely up and down a rod, so that when a pivotted lever lifts the rod a discharge ensues. Upon the rising of the float with the valve, the lever's inner end presses against a cam pivotted upon the rod which, when lifted to a certain extent, slips to one side and lets the lever pass; in another shape the lever's end is hinged so as to press against a projection on the rod, the pull chain being replaced with a rod moved by means of an arm upon the closet seat. For intermittent and automatical siphons, a shallow dish seals the bottom of the stand-pipe, and small siphons, hung over the stand-pipe's edge, serve to facilitate the starting of the flush. An auxiliary ball-cock is also used for starting the flush of automatical siphon cisterns, the cock being opened by the rising, when the water attains its top level, of the inner end of a pivotted float arm, whose pressure upon the valve against its seating is thereupon relaxed, or a screw and nut may be employed to keep the valve always open to a small degree.

18,543.—ACETYLENE LAMPS: *J. Bilbie & H. Drivet.*—A water jacket encloses the carbide chamber, which is closed at its upper end with a cap, and is mounted in the water chamber in such a manner as to press the feeding-wick's upper end against the gauze in the carbide chamber, whilst contact between the lamp and the wick is prevented by turning or unscrewing the water chamber; the burner tube, on which the combustion chamber is placed, has a packing of cotton wool or metal shavings, together with packing rings of india-rubber or similar material, a vent tap for the water chamber, and screw taps for the water jacket and chamber, are provided.

18,637. — MOULDS FOR CISTERNS, BATHS, SINKS, TANKS, &c.: *J. Shanks.* — These consist of a skeleton framing with, it may be, wire netting on the side which is nearer to the pattern, sand is passed through the interspaces and pressed into position; the pattern may be made in two parts, a perforated metal shell being used to support the moulding material, and one part of the mould may be of the ordinary kind, or a cast-iron block, as a chill mould, can be used.

18,647.—MATERIAL FOR STATUARY, COLUMNS, ORNAMENTS, &c.: *J. Steiger.*—The articles are moulded from an admixture of powdered calcined magnesite and water, and the magnesium oxide is reconverted into magnesium carbonate by exposing them to the action of carbonic acid gas.

18,654.—HYDRAULIC CEMENT: *J. Steiger.*—Calcined and powdered magnesite, in about an equal part, is mixed with certain silicates, such as powdered slag, slagwool, or scoria; the mixture, whether first calcined or not, will serve for a cement when water has been added to it.

## SOME RECENT SALES OF PROPERTY:

### ESTATE EXCHANGE REPORT.

December 13.—By MESSRS. SPELMAN (at Norwich).

| | |
|---|---|
| Norwich.—Wensum-st., &c., two freehold building sites, area 1,256 ft. | £800 |
| Wensum-st., two freehold building sites, with premises thereon, area 3,148 ft. | 800 |

December 18.—By TYSER, GREENWOOD, & CRIER.

| | |
|---|---|
| Chiswick.—12 and 14, Chifton-gardens, u.t. 80 yrs., g.r. 12*l.* | 535 |
| 33 and 35, Stonehill-rd., u.t. 69 yrs., g.r. 10*l.* | 410 |

By FIELD & SONS.

| | |
|---|---|
| Southwark.—62 and 64, Sumner-st., f., e.r. 180*l.* | 2,600 |
| 60, Sumner-st., area 814 ft., f., r. 24*l.* | 530 |
| Poplar.—228, East India Dock-rd., f., e.r. 100*l.* | 1,400 |
| Camberwell.—38, Paulet-rd., u.t. 68 yrs., g.r. 7*l.*, e.r. 42*l.* | 400 |

December 19.—By GEORGE BILLINOS.

| | |
|---|---|
| Finsbury Park.—25, Somerfield-rd., u.t. 32 yrs., g.r. 6*l.* 6s., r. 36*l.* | 420 |

December 20.—By H. R. FARNAN.

| | |
|---|---|
| Camberwell.—111, Boyson-rd., u.t. 51½ yrs., g.r. 5*l.* 5s., r. 40*l.* | 455 |
| Brixton.—105, Akerman-rd., u.t. 63½ yrs., g.r. 5*l.*, r. 30*l.* | 315 |

By H. E. FOSTER & CRANFIELD.

| | |
|---|---|
| Clapham Junction.—42, 44, and 46, Webb's-rd., u.t. 89 yrs., g.r. 24*l.*, r. 120*l.* | 1,045 |

By MESSRS. ALDRIDGE.

| | |
|---|---|
| Wimbledon.—51, Pelham-rd., u.t. 96 yrs., g.r. 12*l.* 10s., r. 40*l.* | 310 |

*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

## PRICES CURRENT OF MATERIALS:

### WOOD.*

Per Petersburg standard hundred.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| White Sea: first yellow deals | 18 | 0 | 0 | 21 | 10 | 0 |
| Second do. | 16 | 0 | 0 | 18 | 0 | 0 |
| Third do. | 13 | 10 | 0 | 15 | 0 | 0 |
| Battens, 40s., 30s., and 15s. less respectively. | | | | | | |
| Petersburg: first yellow deals | 15 | 0 | 0 | 17 | 10 | 0 |
| Second do. | 12 | 0 | 0 | 13 | 10 | 0 |
| Battens, 30s. and 20s. less respectively. | | | | | | |
| Petersburg, white deals | 10 | 10 | 0 | 12 | 10 | 0 |
| Do. white battens | 9 | 0 | 0 | 10 | 0 | 0 |
| Riga, white deals | 9 | 10 | 0 | 10 | 10 | 0 |
| Swedish mixed yellow deals | 16 | 0 | 0 | 18 | 0 | 0 |
| Third do. | 14 | 0 | 0 | 16 | 0 | 0 |
| Fourth do. | 12 | 0 | 0 | 13 | 0 | 0 |
| Fifth do. | 11 | 0 | 0 | 12 | 0 | 0 |
| Battens, 30s., 20s., and 10s. less respectively. | | | | | | |
| Whitewood, 10 to 20 per cent. less. | | | | | | |
| Finnish unsorted yellow deals | 11 | 0 | 0 | 11 | 10 | 0 |
| Battens, 10s. and 5s. less respectively. | | | | | | |
| Whitewood, 5 to 10 per cent. less. | | | | | | |
| Norwegian second yellow battens | 8 | 0 | 0 | 8 | 10 | 0 |
| Third do. | 7 | 15 | 0 | 8 | 0 | 0 |
| Fourth do. | 7 | 10 | 0 | 7 | 15 | 0 |
| Whitewood, 10s. less. | | | | | | |
| Danzig, Crown Deck deals, per 40 ft. 3 in. | 0 | 15 | 0 | 1 | 5 | 0 |
| Brack | 0 | 12 | 0 | 1 | 0 | 0 |
| St. Lawrence Pine deals, &c., per P.S.H.:— | | | | | | |
| 1st, Bright and Dry, regular sizes | 20 | 0 | 0 | 27 | 0 | 0 |
| " " oddments | 13 | 0 | 0 | 20 | 0 | 0 |
| 2nd " regular sizes | 15 | 0 | 0 | 17 | 10 | 0 |
| " " oddments | 10 | 0 | 0 | 14 | 0 | 0 |
| 3rd " regular sizes | 9 | 0 | 0 | 11 | 0 | 0 |
| " " oddments | 7 | 10 | 0 | 9 | 10 | 0 |
| 4th " regular sizes | 8 | 0 | 0 | 9 | 0 | 0 |
| " " oddments | 7 | 0 | 0 | 8 | 10 | 0 |
| St. Lawrence Spruce deals, &c. | | | | | | |
| First, regular sizes | 9 | 10 | 0 | 12 | 10 | 0 |
| Second " | 9 | 0 | 0 | 9 | 10 | 0 |
| Third " | 8 | 15 | 0 | 9 | 0 | 0 |
| Fourth " | 8 | 0 | 0 | 8 | 10 | 0 |
| Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively. | | | | | | |
| New Brunswick Spruce deals, &c. | 8 | 10 | 0 | 9 | 0 | 0 |
| Oddments, battens, and fourths | 8 | 0 | 0 | 8 | 10 | 0 |
| United States pitch pine planks and boards | 10 | 0 | 0 | 13 | 0 | 0 |
| Prepared Boards, per square | | | | | | |
| 1¼ by 6½ and 7 in. 1st yellow | | 10 | 0 | | 15 | 0 |
| " " 2nd " | | 9 | 6 | | 12 | 0 |
| 1 by 6½ and 7 in. 1st " | | 9 | 6 | | 11 | 0 |
| " " " white | | 8 | 0 | | 9 | 6 |
| " " 2nd yellow | | 8 | 0 | | 10 | 0 |
| " " " white | | 7 | 0 | | 8 | 0 |
| ¾ by 6½ & 7 in. 1st & 2nd yellow | | 7 | 9 | | 9 | 0 |
| " " " white | | 7 | 6 | | 8 | 6 |
| ¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded) | | 8 | 0 | | 9 | 6 |
| ¾ by 6½ and 7 in. 2nd yellow and white (ditto) | | 7 | 6 | | 8 | 6 |

* The prices named are for the wood as imported and landed in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices.

## PRICES CURRENT—*continued.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| ¾ by 6½ and 7 in. 1st yellow and white (ditto) | | | | | 7 | 6 |
| ¾ by 6½ and 7 in. 2nd yellow and white (ditto) | | 6 | 0 | | 7 | 0 |
| Narrower widths at 10 per cent. less. 3rd quality at 15 per cent. less than 2nd. | | | | | | |
| Danzig and Memel Fir Timber—per load | | | | | | |
| Best middling | 3 | 15 | 0 | 4 | 0 | 0 |
| Good middling and Second | 3 | 5 | 0 | 3 | 10 | 0 |
| Common middling | 3 | 0 | 0 | 3 | 5 | 0 |
| Undersized | 3 | 0 | 0 | 3 | 5 | 0 |
| Swedish and Norwegian Balks | 2 | 10 | 0 | 2 | 15 | 0 |
| Baltic Oak Timber— | | | | | | |
| Danzig and Stettin—Large | 3 | 5 | 0 | 4 | 5 | 0 |
| Small | 2 | 10 | 0 | 3 | 5 | 0 |
| Quebec Timber per load | | | | | | |
| Yellow Pine | 4 | 15 | 0 | 6 | 5 | 0 |
| Oak | 4 | 12 | 6 | 6 | 15 | 0 |
| Elm | 4 | 2 | 6 | 4 | 7 | 6 |
| Ash | 3 | 7 | 6 | 4 | 2 | 6 |
| Birch | 3 | 7 | 6 | 5 | 15 | 0 |
| New Brunswick, &c., Birch | 3 | 2 | 6 | 3 | 12 | 6 |
| American Pitch Pine Timber | 3 | 17 | 6 | 4 | 10 | 0 |
| Wainscot, per log, 18 cubic ft.— | | | | | | |
| Crown (Eng. & Dutch) } nominal | 3 | 7 | 6 | 4 | 10 | 0 |
| Brack } nominal | 2 | 12 | 6 | 3 | 12 | 6 |
| Lathwood, per cubic fathom— | | | | | | |
| Petersburg | 4 | 0 | 0 | 6 | 10 | 0 |
| Riga and Danzig | 4 | 10 | 0 | 5 | 10 | 0 |
| Norway Poles, per ft. run | 0 | 0 | 1 | 0 | 0 | 1½ |
| Oak Staves, per mille full size pipe | | | | | | |
| Memel, Crown | 220 | 0 | 0 | 230 | 0 | 0 |
| Brack | 190 | 0 | 0 | 200 | 0 | 0 |
| Danzig | 165 | 0 | 0 | 175 | 0 | 0 |
| Bosnia, single Barrel (nominal) | 28 | 0 | 0 | 30 | 0 | 0 |
| United States, Pipe | 37 | 10 | 0 | 45 | 0 | 0 |
| Hogshead, extra heavy and double extra | 32 | 0 | 0 | 35 | 0 | 0 |
| Indian Teake per load | 11 | 10 | 0 | 17 | 0 | 0 |
| British Guiana Greenheart | 0 | 0 | 0 | 8 | 0 | 0 |
| Mahogany, per foot superficial— | | | | | | |
| Honduras, cargo average | 0 | 0 | 5 | 0 | 0 | 6½ |
| Nicaragua, do. | 0 | 0 | 4½ | 0 | 0 | 5½ |
| Tabasco, do. | 0 | 0 | 4½ | 0 | 0 | 6½ |
| Mexican, do. | 0 | 0 | 4 | 0 | 0 | 4½ |
| Panama, do. | 0 | 0 | 3 | 0 | 0 | 4 |
| African, do. | 0 | 0 | 3½ | 0 | 0 | 5½ |
| Cuba, do. | 0 | 0 | 6 | 0 | 0 | 8 |
| St. Domingo, do. | 0 | 0 | 5 | 0 | 0 | 7½ |
| Do. Curls (good to prime) | 0 | 0 | 9 | 0 | 1 | 3 |
| Walnut, American (logs) | 0 | 2 | 3 | 0 | 4 | 6 |
| Do. do. (planks and boards) | 0 | 2 | 0 | 0 | 7 | 6 |
| Italian, per foot superficial | 0 | 0 | 3 | 0 | 0 | 7½ |
| Black Sea, per ton | 6 | 0 | 0 | 12 | 0 | 0 |
| Satin Walnut (logs) per foot cube | 0 | 1 | 0 | 0 | 1 | 3 |
| " (planks and boards) | 0 | 2 | 0 | 0 | 2 | 9 |
| Sequoia (Californian redwood), per foot cube | 0 | 1 | 9 | 0 | 2 | 0 |
| Whitewood, American (logs) | 0 | 1 | 3 | 0 | 1 | 6 |
| " " (planks and boards) | 0 | 1 | 6 | 0 | 2 | 9 |
| Quartered oak " " " | 0 | 2 | 3 | 0 | 4 | 0 |
| Kauri pine (logs) | 0 | 1 | 9 | 0 | 2 | 0 |
| " " (planks) | 0 | 2 | 3 | 0 | 2 | 9 |
| Jarrah (planks) | 0 | 2 | 0 | 0 | 2 | 3 |
| Lancewood spars each, fresh and large | 0 | 5 | 0 | 0 | 8 | 0 |
| Lancewood spars, ordinary to fair | 0 | 4 | 0 | 0 | 5 | 0 |
| Degame spars | 0 | 8 | 0 | 0 | 10 | 0 |

### METALS.

| | | | | | | |
|---|---|---|---|---|---|---|
| IRON—Pig, in Scotland ton | 3 | 2 | 8 | 0 | 0 | 0 |
| Bar, Welsh, in London | 9 | 0 | 0 | 9 | 15 | 0 |
| Do. do. at works in Wales | 8 | 10 | 0 | 9 | 0 | 0 |
| Do. Staffordshire, in London | 9 | 15 | 0 | 11 | 15 | 0 |
| COPPER—British cake and ingot | 74 | 0 | 0 | 74 | 10 | 0 |
| Best selected | 75 | 10 | 0 | 77 | 0 | 0 |
| Sheets, strong | 80 | 0 | 0 | 82 | 0 | 0 |
| Chili bars | 68 | 0 | 0 | 0 | 0 | 0 |
| YELLOW METAL lb. | 6¾d. | | | 7d. | | |
| LEAD—Pig | | | | | | |
| Spanish ton | 16 | 10 | 0 | 0 | 0 | 0 |
| English Com. Brands | 16 | 15 | 0 | 0 | 0 | 0 |
| Sheet, English, 6 lbs. per sq. ft. and upwards | 18 | 0 | 0 | 0 | 0 | 0 |
| Pipe | 18 | 10 | 0 | 0 | 0 | 0 |
| ZINC—English sheet ton | 26 | 0 | 0 | 0 | 0 | 0 |
| Vieille Montagne | 27 | 0 | 0 | 0 | 0 | 0 |
| Spelter | 20 | 0 | 0 | 20 | 5 | 0 |
| TIN—Straits | 103 | 5 | 0 | 0 | 0 | 0 |
| Australian | 103 | 10 | 0 | 104 | 0 | 0 |
| English Ingots | 107 | 0 | 0 | 108 | 0 | 0 |
| Banca | 0 | 0 | 0 | 0 | 0 | 0 |
| Billiton | 0 | 0 | 0 | 0 | 0 | 0 |

### OILS.

| | | | | | | |
|---|---|---|---|---|---|---|
| Linseed ton | 21 | 7 | 6 | 0 | 0 | 0 |
| Cocoanut, Cochin | 29 | 15 | 0 | 0 | 0 | 0 |
| Do. Ceylon | 26 | 15 | 0 | 0 | 0 | 0 |
| Palm, Lagos | 27 | 10 | 0 | 0 | 0 | 0 |
| Rapeseed, English, pale | 24 | 10 | 0 | 0 | 0 | 0 |
| Do. Brown | 23 | 0 | 0 | 0 | 0 | 0 |
| Cottonseed ref. | 19 | 10 | 0 | 20 | 0 | 0 |
| Oleine | 17 | 5 | 0 | 19 | 5 | 0 |
| Lubricating U.S. | 0 | 8 | 0 | 0 | 0 | 0 |
| Do. Black | 0 | 7 | 6 | 0 | 0 | 0 |
| TAR—Stockholm barrel | 1 | 6 | 6 | 0 | 0 | 0 |
| Archangel | 1 | 0 | 0 | 0 | 0 | 0 |
| Turpentine | 37 | 0 | 0 | 37 | 2 | 6 |

## TO CORRESPONDENTS.

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## TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BOURNEMOUTH.—For constructing 27-in. cast-iron and other relief sewers in the Ashley and Waterloo roads, Vale and Church roads, and Poole, Seamoor, and Alumhurst roads, and other works in connexion therewith, for the Borough of Bournemouth. Mr. F. W. Lacey, Borough Engineer and Surveyor :—

| | | | |
|---|---|---|---|
| J. & T. Binns | £4,156 | Grounds & Newton, 12, Triangle, Bournemouth* | £3,734 |
| Cooke & Co. | 3,937 | | |

CHESTERFIELD. — For additions to offices. Mr. J. P. Earle, architect, Sheffield :—

| | | | |
|---|---|---|---|
| J. Wright | £500 | Marsden Bros.* | £469 |

HITHER GREEN.—For the erection of schoolroom, class-rooms, and manse at Torridon-road, Hither Green, for the trustees of the Bible Christian Church. Mr. E. J. Hamilton, architect, 2, New-road, Brighton :—

| | | | |
|---|---|---|---|
| Foster Bros. | £3,745 0 0 | Bush & Son | £3,410 0 0 |
| E. Jones | 3,680 1 5 | Hibberd Bros.* | 3,288 0 0 |
| Castle & Son | 3,600 0 0 | | |

LONDON.—For the erection of new premises, Finsbury-circus and London Wall. Messrs. Davis & Emanuel, architects. Quantities by Mr. Walter Lawrence :—

| | | | |
|---|---|---|---|
| Holloway Bros. | £243,605 | Foster & Dicksee | £227,600 |
| Hall, Beddall, & Co. | 241,713 | B. E. Nightingale | 227,325 |
| J. Carmichael | 239,108 | Cubitt & Co. | 226,453 |
| Trollope & Sons | 236,800 | Colls & Sons | 225,900 |
| Higgs & Hill, Ltd. | 235,666 | Patman & Fotheringham | 223,840 |
| Holland & Hannen | 234,770 | H. Lovatt | 214,650 |
| Lawrence & Sons | 233,768 | | |

LUDLOW.—For laying down cast-iron water mains, hydrants, &c.; also for covered reservoir and tanks, for the Hon. Lucius O'Brien. Mr. J. Fletcher Trew, C.E., County Chambers, Gloucester. Quantities by Mr. W. T. Bennett, Gloucester :—

| | | | |
|---|---|---|---|
| Meredith | £1,979 1 3 | Law | £1,750 0 0 |
| Scull Bros. | 1,788 12 4 | Bryan* | 1,639 18 3 |
| Vale | 1,788 12 2 | | |

*Pipe Laying only.*

| | | | |
|---|---|---|---|
| Blundell | £808 9 1 | Beaven | £773 1 0 |

MELTHAM.—For laying about two miles of earthenware and cast-iron pipe sewers, for the Urban District Council. Messrs. J. B. Abbey & Son, engineers, 34A, New-street, Huddersfield :—

| | | | |
|---|---|---|---|
| Waring & Sons | £4,558 11 6 | B. Graham & Sons | £2,919 0 0 |
| R. Walker | 3,877 0 0 | R. Turner | 2,870 0 0 |
| H. Bentley | 3,477 16 6 | Mallinson & Sons, Lockwood, Huddersfield* | 2,249 0 0 |
| J. E. Kaye | 3,300 0 0 | Matthew Hall & Son | 2,007 6 5 |
| Walker & Co. | 3,071 2 5 | | |
| A. Graham & Sons | 3,027 0 0 | | |

SCARBOROUGH. — For the erection of cottages, Cloughton, for Mr. H. E. Donner. Mr. Chas. Edeson, architect, 25, Huntriss-row, Scarborough. Quantities by architect :—

*Bricklaying.*

J. W. Bland, Nelson-street* ..... £793 0 0

*Joinery.*

J. P. Richardson, Castle-road* ..... 267 0 0

*Smiths.*

M. Whitehead, King-street* ..... 22 8 9

*Painting.*

Shirtcliffe & Knowles, Gladstone-lane* 36 16 4½

*Plumbing.*

Stephenson Bros., Queen-street* .... 79 13 0

SHEFFIELD.—For additions to the "Victoria Hotel," near Sheffield. Mr. J. P. Earle, architect, Sheffield :—

| | | | |
|---|---|---|---|
| Raw & Son | £613 | Dickens | £475 |
| Dyson | 526 | May* | 469 |

SHEFFIELD.—For erecting cutlery workshops. Mr. J. P. Earle, architect, Sheffield :—

Raw & Son* ..... £475

WOODSEATS (near Sheffield).—For new steam laundry. Mr. J. P. Earle, architect, Sheffield :—

*First contract.*

| | | | |
|---|---|---|---|
| J. H. Hirst | £2,325 | Margerrison & Son* | £2,300 |


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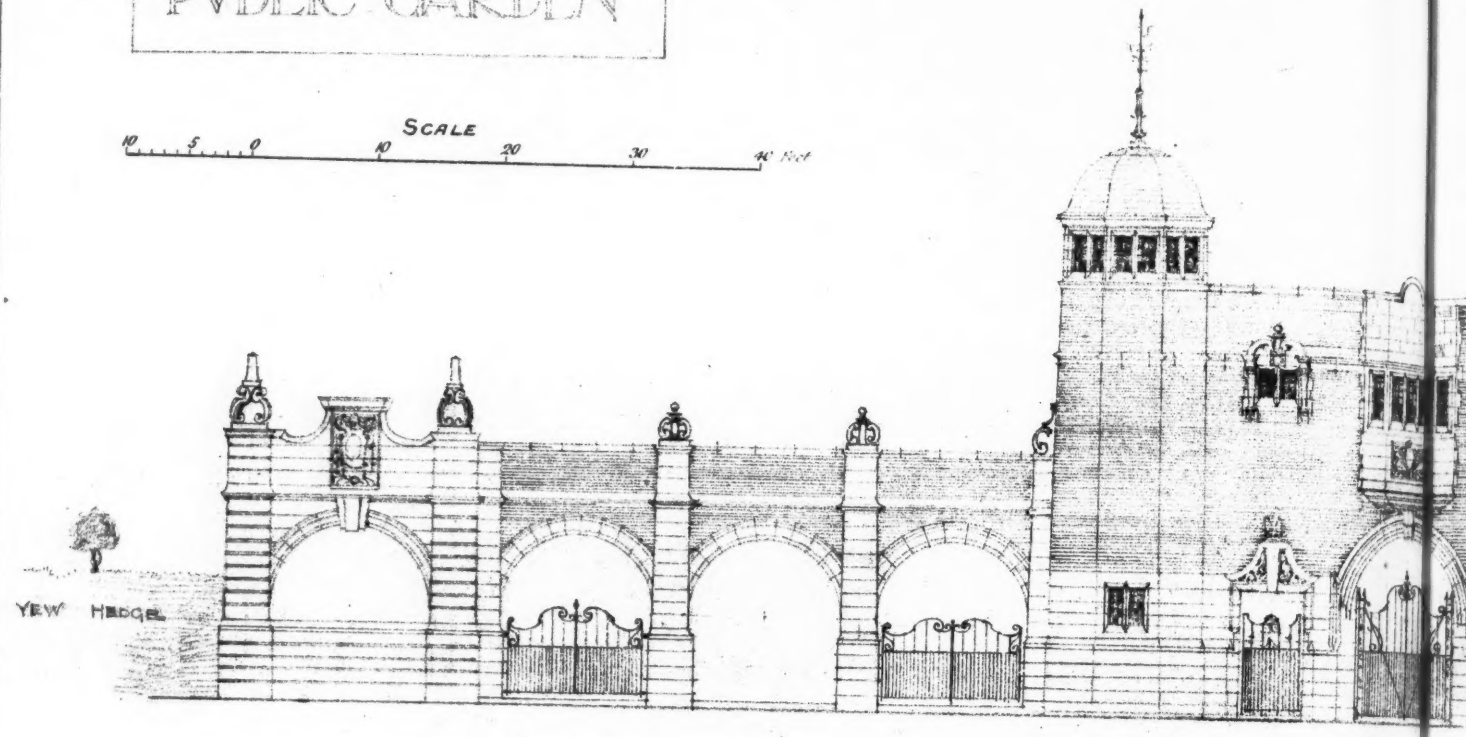


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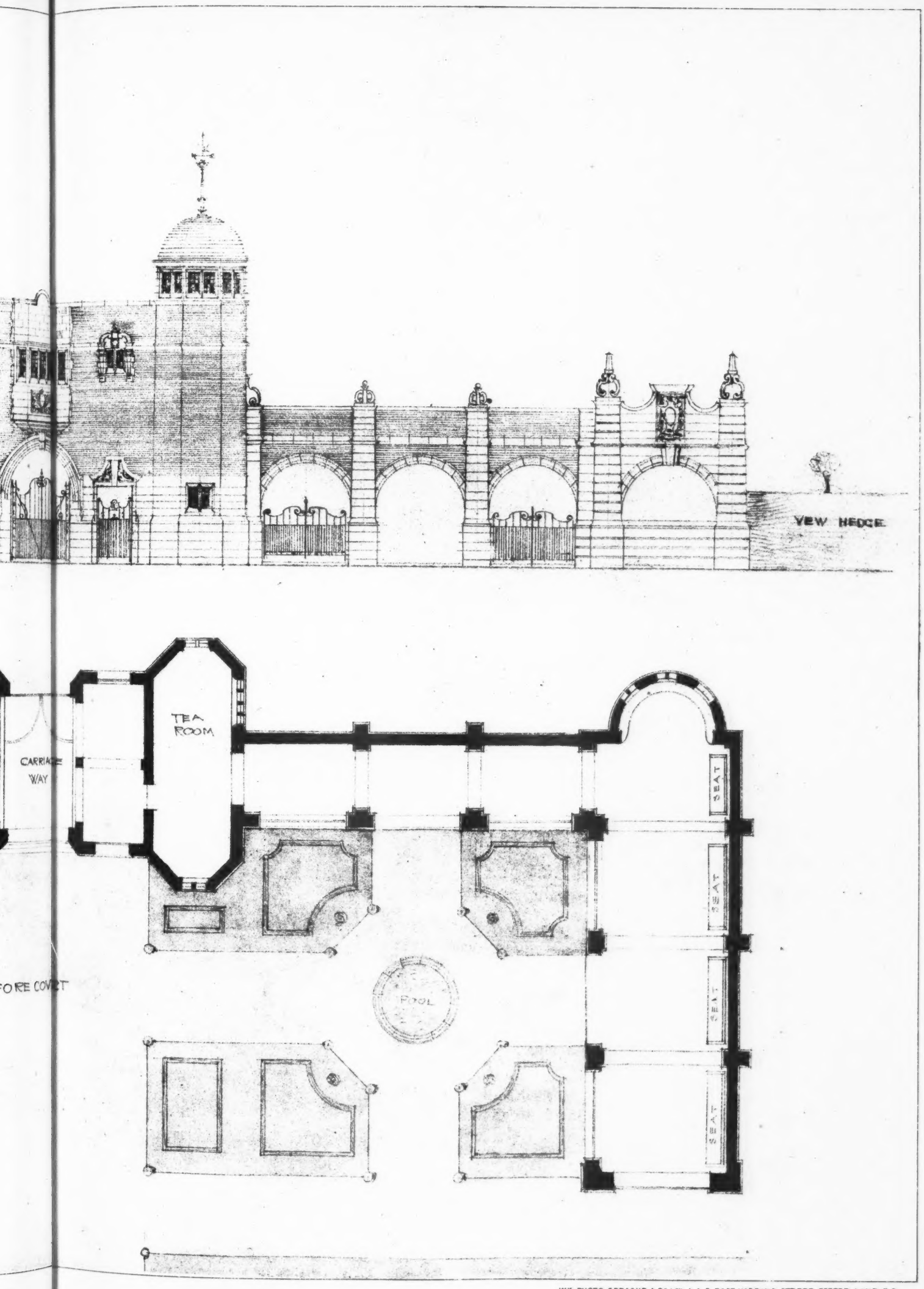


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A PUBLIC GARDEN.—By Mr. H. Inigo Triggs, A.R.I.B.A.

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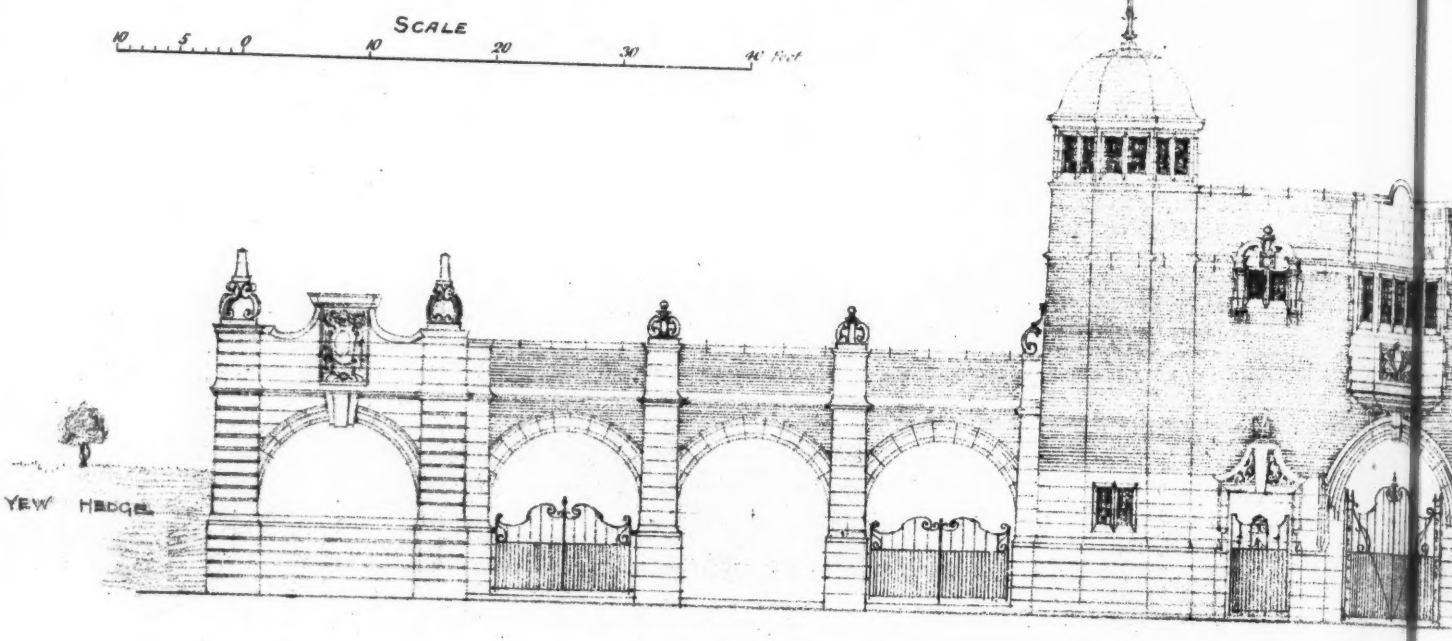


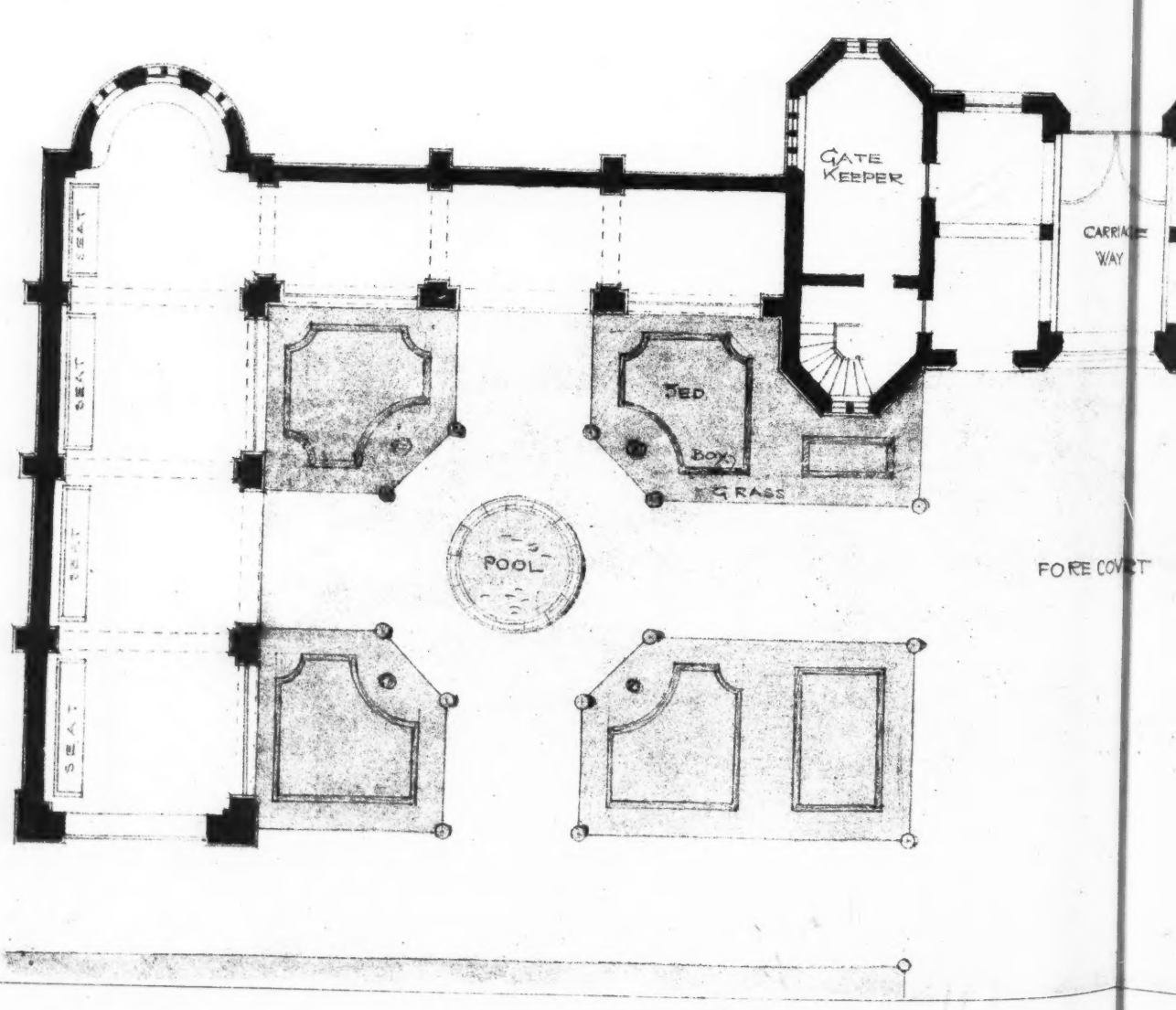


*Royal Academy Prize for Architectural Design (Upper School), 1899*

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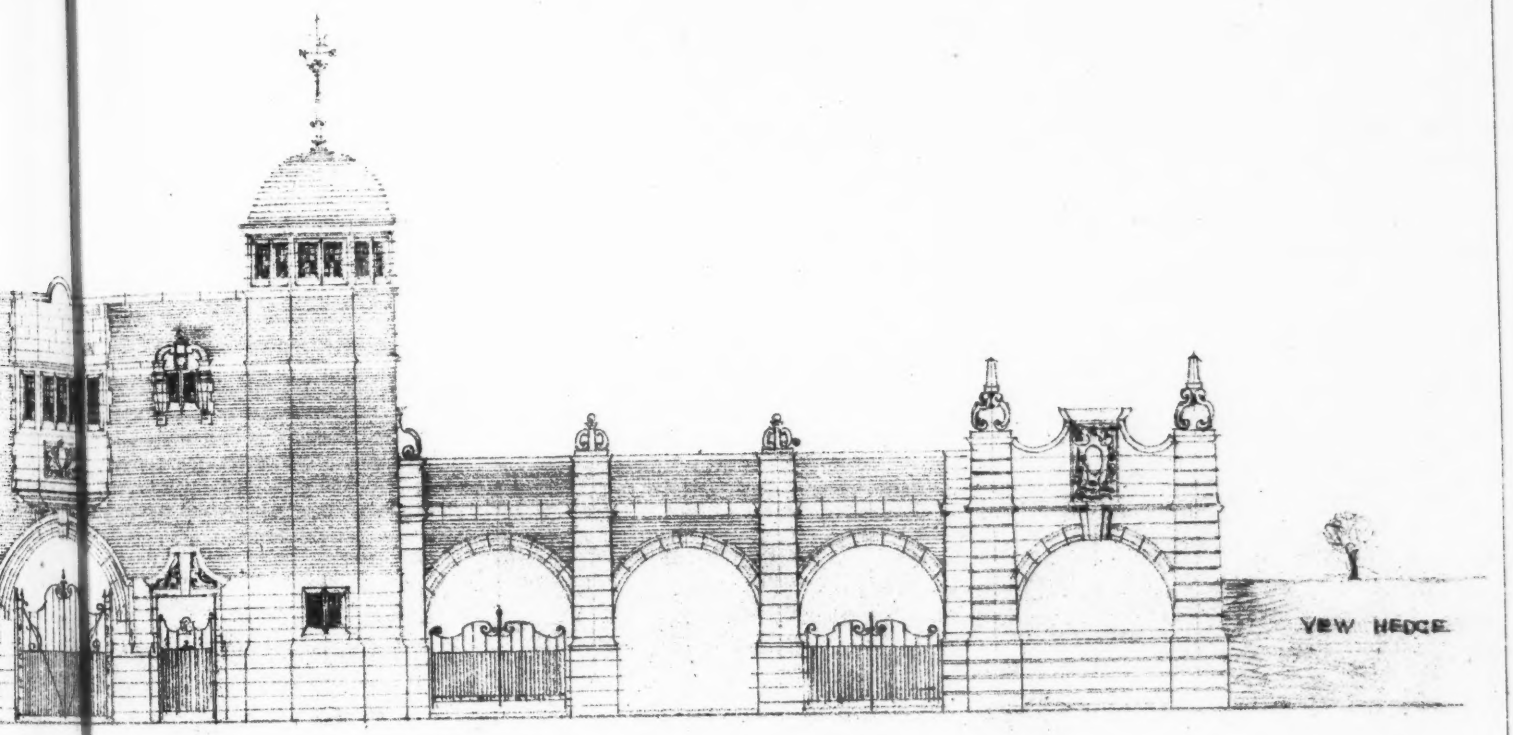


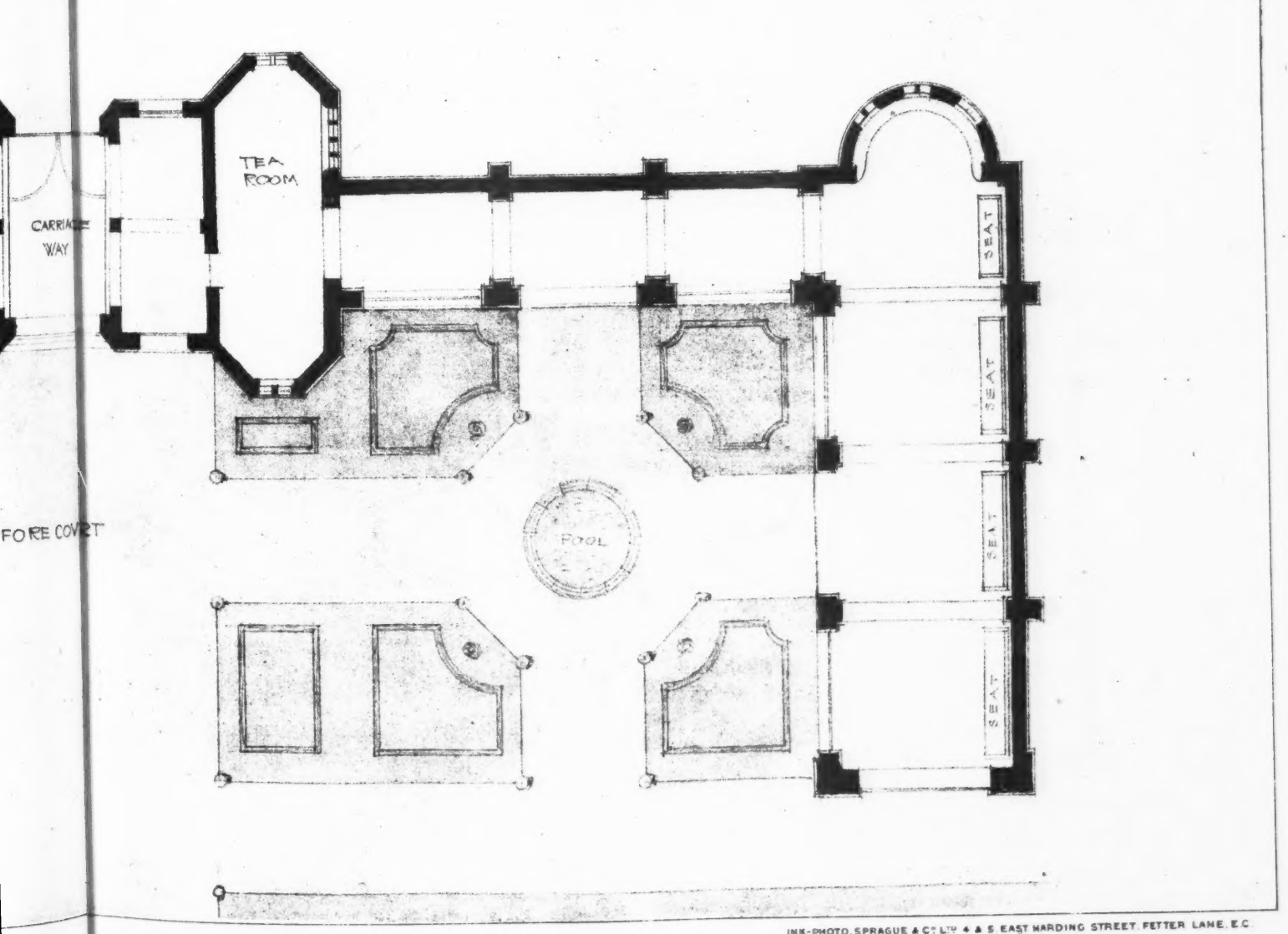


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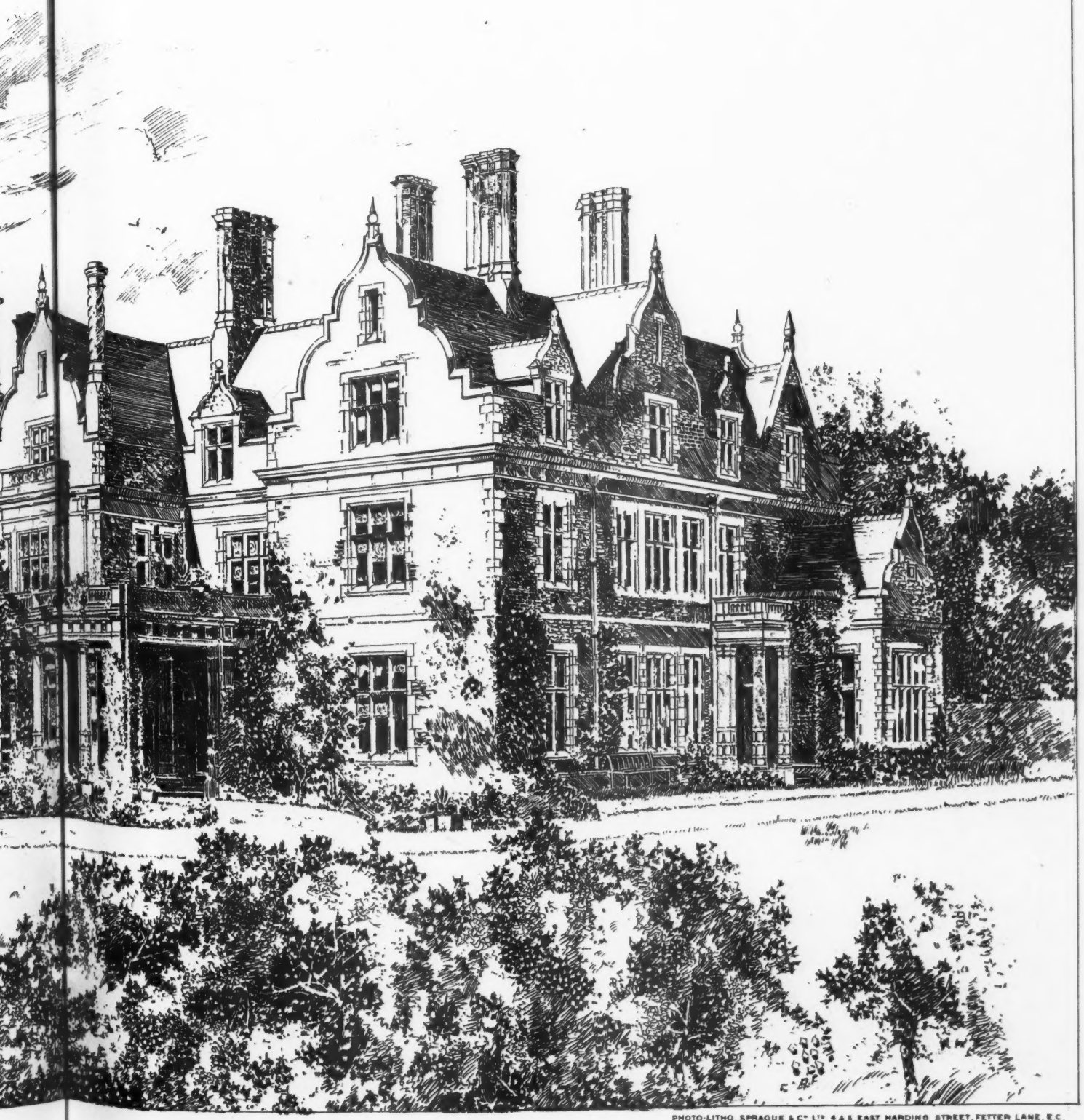

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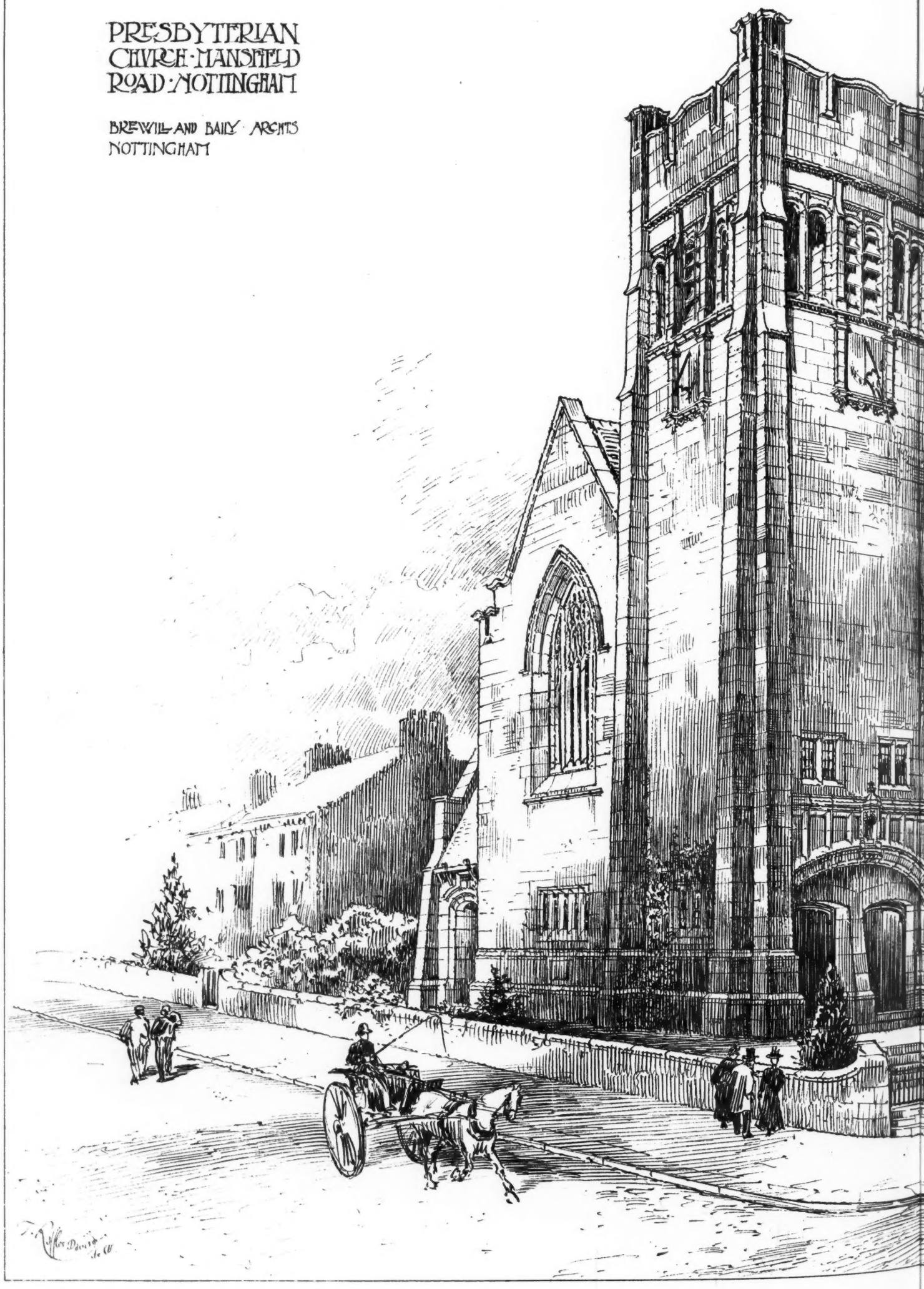

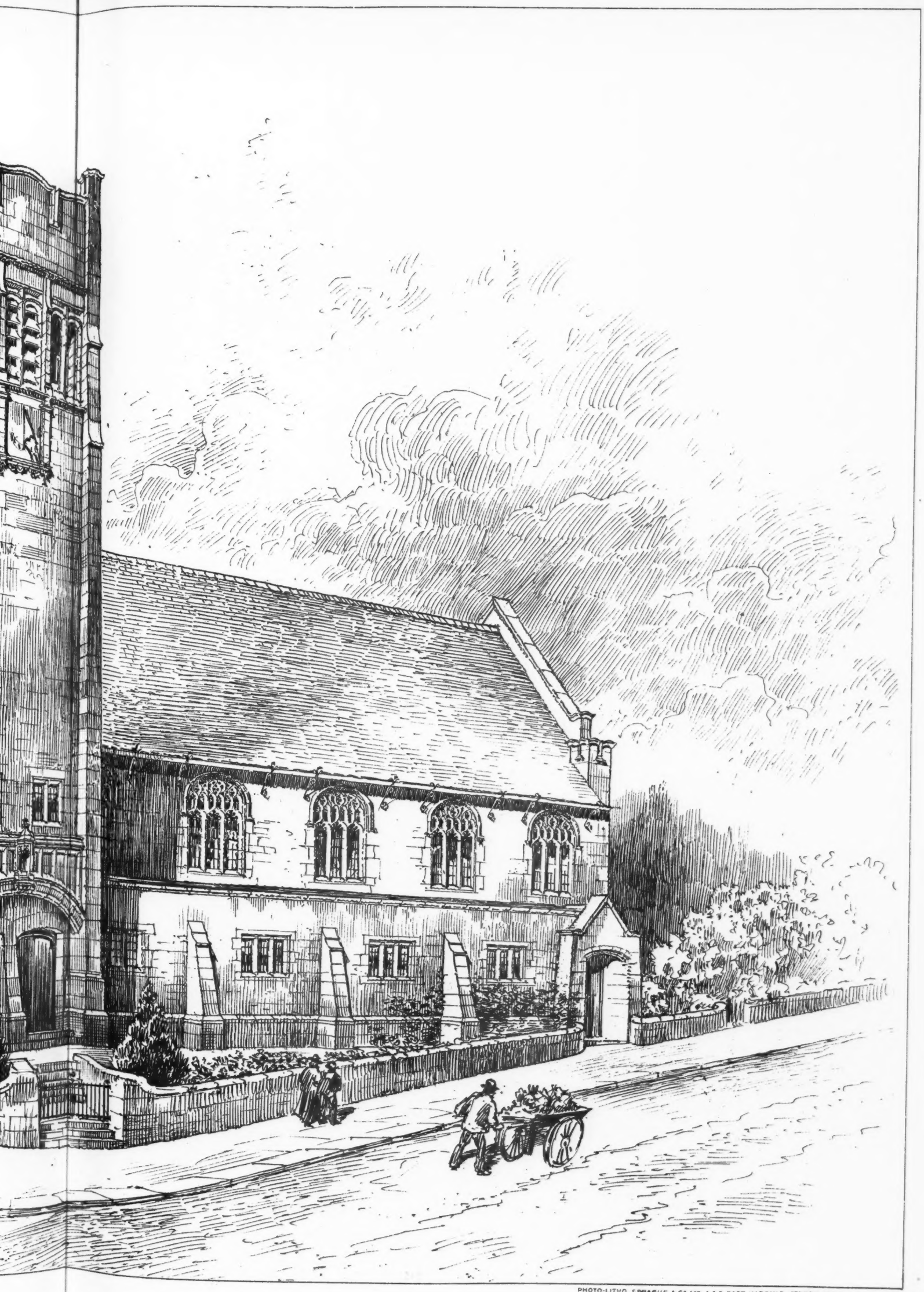

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# The Builder

A JOURNAL FOR THE

# Architect, Engineer, Operative & Artist.

VOL. LXXVII. No. 2969. *Fifty-seventh Year.*

**DECEMBER 30, 1899.**

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(For Alphabetical List of Firms appearing in this List and reference to current Advertisements see opposite Page.)

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Haskins, S. & Bros.
Shingleton, A. J.
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Burham Brick and Cement Co.
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Coles, Shadbolt, & Co.
Dennis, Henry
Doulton & Co. Ltd.
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Farnley Iron Co. Ltd.
Hambleta, Ltd.
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Hartshill Brick and Tile Co.
Hooper & Ashby
Irthlingboro' Brick & Tile Co.
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Knowles, J. & Co.
Lawrence, T. & Sons
Lee, H. J.
Newton, J. & Sons
Plowman, T. & M.
Richardson, A. & W. T.
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Smeed, Dean, & Co. Ltd.
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Helliwell & Co. Ltd.
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Harbrow, W.
King & Scarborough
Lascelles, W. H. & Co.
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**SOLID in COLOUR, RELIEF, and VALUE.**

The Manufacturers have issued a Book containing more than 50 Patterns in

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At the uniform price of ONE SHILLING per Yard.

## CAMÉOID, HIGH-RELIEF AND LOW-RELIEF CEILINGS, FRIEZES, &c. &c.

The new Embossed Decorative Material for Ceilings and Walls, a material thoroughly reliable, and of highest quality.

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Estimates and Particulars on Application.

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### COMPETITION.

## PROPOSED CHURCH and VICARAGE

of ST. EDWARD,

KINGSTONE PLACE, BARNSLEY, YORKSHIRE.

COMPETITIVE DRAWINGS and DESIGNS are invited from Architects.

First Premium, 50 Guineas.
Second do. 30 do.
Third do. 20 do.

Full particulars, conditions, and plan of site may be obtained from us, the undersigned, on payment of 2l. 2s. which will be returned on receipt of bonâ-fide drawings.

All drawings and designs must be lodged with us not later than FIVE p.m. on the 12th FEBRUARY, 1900.

LANCASTER & SONS,
Church-street,
Barnsley.

### CONTRACTS.

## UXBRIDGE RURAL DISTRICT COUNCIL.

RUISLIP MAIN-DRAINAGE WORKS.

TENDERS are invited for the CONSTRUCTION of about thirteen miles of STONEWARE and CAST-IRON PIPE SEWERS, with inspection chambers, flushing tanks, and other works.

Plans, sections, and specifications of the work required may be seen on and after MONDAY, 1st JANUARY, 1900, at the Office of Mr. JOHN ANSTIE, C.E. and Engineer to the Council, 10, Marchwood-crescent, Ealing, where also the schedule of quantities and form of Tender can be obtained on deposit of 5l. such sum to be refunded on a receipt by me of a bonâ-fide Tender, accompanied by the schedule of quantities fully priced out, and the return of the specification to the Engineer.

The person or firm whose Tender is accepted will be required to enter into a written contract, and to provide two satisfactory sureties for the due completion of the same.

Tenders, endorsed "Tender for the Ruislip Main Sewerage," to be delivered at my Office before NOON on MONDAY, 22nd JANUARY next.

The Council do not bind themselves to accept either the lowest or any Tender.

CHARLES WOODBRIDGE,
Clerk.

No. 38, High-street, Uxbridge,
December 19th, 1899.

## BOROUGH of TUNBRIDGE WELLS.

TO BUILDERS AND CONTRACTORS.

ENLARGEMENT OF ELECTRIC LIGHTING STATION.

The Corporation of the Borough are prepared to receive TENDERS for the ENLARGEMENT of their CENTRAL ELECTRIC LIGHTING STATION, adjoining the South Eastern Railway Goods Station, at Tunbridge Wells, to be carried out under the superintendence and in accordance with drawings prepared by Mr. C. H. STRANGE, A.R.I.B.A. of Tunbridge Wells.

The drawings and specification may be inspected at my Office at the Town Hall.

Persons wishing to Tender may obtain bills of quantities on application to me, accompanied by a fee of Two Guineas, which fee will be returned on receipt of a bonâ-fide Tender.

The person or firm whose Tender is accepted will be required to enter into a formal contract and a bond, with two approved sureties, for the due performance of the contract.

Sealed Tenders, endorsed "Electric Light Station," must be sent to me not later than the 15th JANUARY, 1900.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
W. C. CRIPPS,
Town Clerk.

Town Hall,
Tunbridge Wells.
December 21st, 1899.

## ST. PANCRAS, LONDON.

TO BUILDERS.

The Vestry of St. Pancras hereby invite TENDERS for the ERECTION of PUBLIC BATHS and WASHHOUSES on land facing Prince of Wales-road, Kentish Town, N.W.

The drawings, specification, conditions of contract, form of contract, and form of bond can be inspected, and bills of quantities and form of Tender obtained, at the Offices of the Architect, Mr. T. W. ALDWINCKLE, F.R.I.B.A. 1, Victoria-street, S.W. on and after the 2nd JANUARY, 1900, between the hours of TEN and FOUR, upon depositing the sum of Twenty Pounds (20l.) in gold or Bank of England Note, which will be returned to the depositor if he sends in a bonâ-fide Tender in accordance with the terms of this Advertisement.

Each Tender must be accompanied by the bills of quantities, fully priced and moneyed out, in a sealed envelope, with the tenderer's name outside, and no Tender will be considered unless so accompanied. These bills of quantities will not be opened except in the case of the accepted Tender.

Tenders (which will be received and considered only on the printed form, which must not be varied) must be sealed and endorsed "Tender for Baths and Washhouses, Prince of Wales-road," and are to be addressed to the undersigned and delivered at the Vestry Hall, Pancras-road, N.W. not later than TWELVE o'clock noon, on FRIDAY, the 26th JANUARY, 1900.

The builder whose Tender is accepted will be required to enter into a bond, with two sufficient sureties, for the due performance of the contract.

The Vestry do not bind themselves to accept the lowest or any Tender.

C. H. F. BARRETT,
Vestry Clerk.

Vestry Hall,
Pancras-road, N.W.
December, 1899.

## URBAN DISTRICT COUNCIL of BROMLEY.

UNDERGROUND CONVENIENCE.

The Urban District Council of Bromley are prepared to receive TENDERS for the CONSTRUCTION of an UNDERGROUND CONVENIENCE in Market-square, Bromley, in accordance with the plan, sections, and specification, which may be seen at the Office of the Council's Surveyor.

The bill of quantities and form of Tender may be obtained on payment of Half-a-Guinea, which will be returned on receipt of a bonâ-fide Tender.

Tenders, endorsed "Tender for Underground Convenience," must be delivered, addressed to me as under, not later than THREE o'clock p.m. on TUESDAY, the 2nd day of JANUARY, 1900.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
FRED. H. NORMAN,
Clerk to the Council.

District Council Offices,
Bromley, Kent,
December 13th, 1899.

## COUNTY BOROUGH of BRIGHTON.

TO CONTRACTORS AND OTHERS.

Notice is Hereby Given that the Council of the said County Borough will receive TENDERS from such persons as may be willing to enter into a contract for the CONSTRUCTION of an UNDERGROUND CONVENIENCE, together with sundry Works connected therewith around the base of the Clock Tower, Queen's-road, Brighton.

The specifications, forms of Tender, and bills of quantities may be obtained on application at the Office of the Borough Engineer and Surveyor, Mr. FRANCIS J. C. MAY, Memb.Inst.C.E. at the Town Hall, Brighton, on payment of Three Guineas, which will be returned on receipt of a bonâ-fide Tender.

Sealed Tenders, addressed to me and endorsed "Tender for Construction of Underground Convenience," must be left at my Office, at the Town Hall, before TEN o'clock in the forenoon, on FRIDAY, the 19th day of JANUARY, 1900.

Power is reserved to reject the lowest or any Tender.

FRANCIS J. TILLSTONE,
Town Clerk.

Town Hall, Brighton,
December 21st, 1899.

## HASTINGS UNION.

TO BOILER MAKERS AND STEAM AND HOT-WATER FITTERS.

The Guardians of the above-named Union, invite TENDERS for the SUPPLY and FIXING of BOILERS, and the LAYING-IN of STEAM and HOT-WATER FITTINGS to the Workhouse now being erected at Cackle-street, Ore, Hastings.

Plans and specification of the work, may be seen at the office of the Architects, Messrs. JEFFERY & SKILLER, 5, Havelock-road, Hastings, on and after the 1st day of JANUARY, 1900, between the hours of TEN a.m. and FOUR p.m.

Sealed and endorsed Tenders to be forwarded to the Guardians not later than TWELVE o'clock noon on THURSDAY, the 25th JANUARY, 1900. The Guardians do not bind themselves to accept the lowest or any Tender.

ARTHUR R. INSKIPP,
Clerk.

No. 11, Wellington-square, Hastings,
December 22nd, 1899.

[*See also page vi.*


## ZADIG'S PORTABLE RAILWAYS

SAVE 50% IN LABOUR. PROMPT DELIVERY FROM LONDON STOCK.

The only exhibitors at the Greater Britain Exhibition awarded the Silver Medal for Portable Railway Plant.

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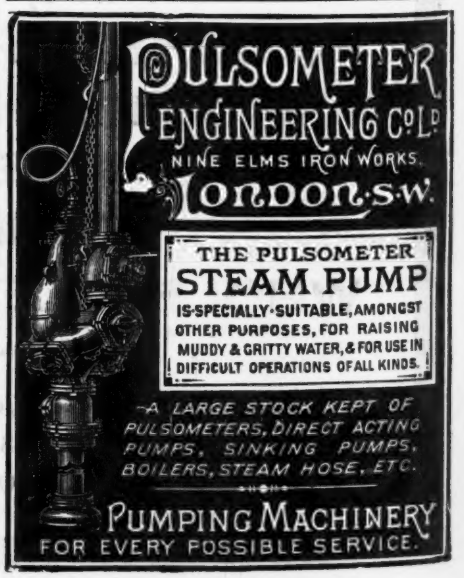
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THE PULSOMETER
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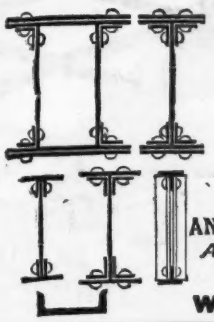

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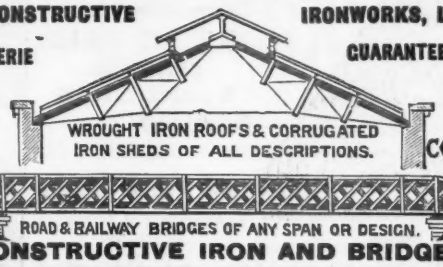


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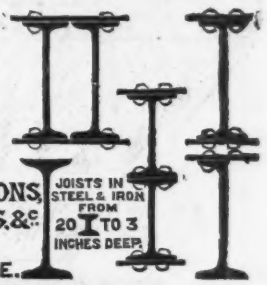


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*Telegraphic Address*—Expansion, London. *Telephone No. 6,784.*

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STEEL STANCHIONS. STEEL ROOFS. STEEL GIRDERS. FIRE-RESISTING DOORS. PUMPING PLANTS. BREWERY WORK.

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8,500 TONS SIEMENS-MARTIN ENGLISH STEEL JOISTS
BESSEMER FOREIGN STEEL JOISTS
*3 to 20 inches deep.* *Always in Stock.*

TEES, ANGLES, CHANNELS, CHEQUERED PLATES, CASTINGS, of Every Description for Building Work.

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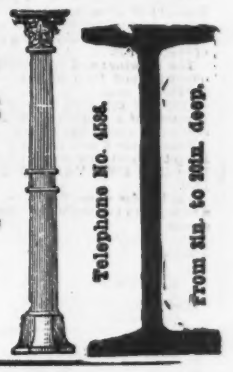


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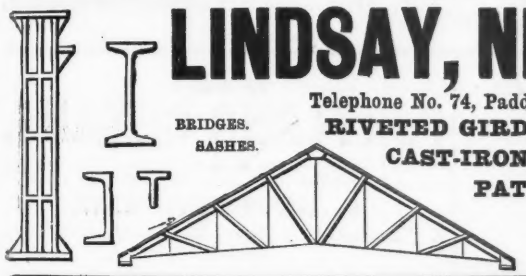


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RIVETED GIRDERS, BRIDGES, FLITCH PLATES, L's and T's,
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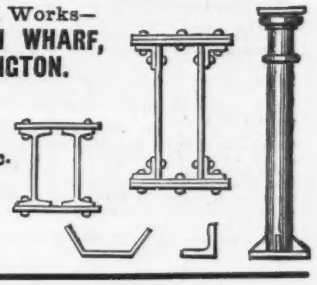

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Channels, Compound Girders, Flitches, Angles and Tees.

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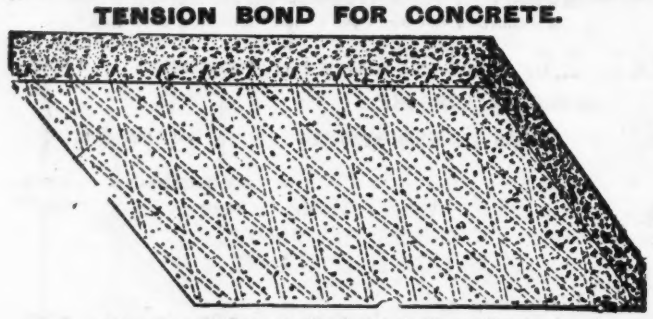
**TENSION BOND FOR CONCRETE.**



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(Large or Small Spans.)

**SOLID AND HOLLOW PARTITIONS.**

2 inches THICK.

**SUSPENDED CEILINGS, &c.**

**AND FOR FENCING,**

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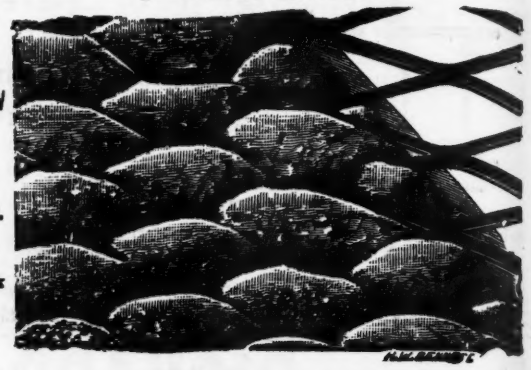

In Stock Sizes or to order.

**THE EXPANDED METAL CO., Ltd., 39, Upper Thames St., LONDON, E.C.**

**WORKS—WEST HARTLEPOOL.**


**CONTRACTS** (*continued from p.* iv.)

## THE STOURBRIDGE and HALESOWEN HOSPITAL COMMITTEE.

ERECTION OF ISOLATION HOSPITAL.

TO BUILDERS.

The above Committee are prepared to receive TENDERS for the ERECTION of an ISOLATION HOSPITAL, comprising Three Wards and an Administration Building, on land situate at Hayley Green, in the Parish of Lutley, being No. 130 on the 25-inch Ordnance Map of that Parish.

The drawings and specification may be inspected, and bills of quantities and form of Tender obtained, at the Office of Mr. A. T. BUTLER, Architect, High-street, Cradley Heath, on and after JANUARY 6th, 1900, between the hours of TEN and FIVE, upon payment of a deposit of 3*l.* 3*s.* which will be returned to persons sending in a bonâ-fide Tender.

Tenders must be sealed, and marked on the outside "Tender for Hospital," and must be delivered at the Office of the undersigned not later than TWELVE o'clock noon, on the 19th day of JANUARY, 1900.

The builder whose Tender is accepted will be required to enter into a bond, with two sufficient sureties, for the due performance of the contract.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
E. H. GROVE.
Clerk to the Committee.

Great Cornbow, Halesowen,
December 27th, 1899

## THE BOARD of WORKS for the LEWISHAM DISTRICT.

TO BUILDERS, CONTRACTORS, AND OTHERS.

PUBLIC LAVATORIES AND SANITARY CONVENIENCE.

The Board is prepared to receive TENDERS for the BUILDING of PUBLIC LAVATORIES and a PUBLIC SANITARY CONVENIENCE in High-street, Lewisham.

Plan and specification of the proposed Lavatories and Convenience, form of contract, and general conditions, may be seen at these Offices (Surveyor's Department) on and after TUESDAY, the 2nd JANUARY, 1900.

A copy of the bills of quantities and form of Tender may be obtained on payment of a deposit of 1*l.* 1*s.* which will be returned on receipt of a bonâ-fide Tender.

The Tenders must be on the forms issued by the Board, enclosed in an envelope, sealed, and endorsed "Tender for Lavatories, &c" and must be delivered by FOUR o'clock on TUESDAY, the 23rd JANUARY, at the Offices of the Board, and placed in the box there provided for the purpose.

The Board does not bind itself to accept the lowest or any Tender.

By order.
EDW. WRIGHT,
Clerk of the Board.

Lewisham Town Hall,
Catford, S.E.
December 27th, 1899.

## TO BUILDERS and CONTRACTORS.—

Builders and Contractors desirous of TENDERING for the ERECTION of WAREHOUSE, &c. in Charles-street and Wilson-street, Long Acre, for Messrs. Samuel Goff & Co. are invited to send their names to Messrs. GOFF, at 83, Long Acre, where drawings and specification can be seen on and after SATURDAY next, the 30th day of DECEMBER, 1899. Bills of quantities will be supplied, for which a deposit of 2*l.* 2*s.* will be required, but this sum will be returned on receipt of a bonâ-fide Tender. Messrs. Goff & Co. do not bind themselves to accept the lowest or any Tender. Tenders to be sent in to Messrs. GOFF & CO. on MONDAY, the 15th day of JANUARY, 1900.

The person whose Tender is accepted will be required to enter into a bond for the due and faithful performance of the terms of the contract.

## BOROUGH of OSWESTRY.

EXTENSION OF MARKET BUILDINGS.

The Town Council of the Borough of Oswestry is prepared to receive TENDERS for the ERECTION and COMPLETION of EXTENSIONS to their Market Buildings; RE-ROOFING portions of the existing BUILDINGS; the CONSTRUCTION of an UNDERGROUND CONVENIENCE; and all other work in connexion therewith, in accordance with the plans and specifications prepared by the Borough Engineer and Surveyor.

Plans, specifications, and general conditions can be seen, and bill of quantities and form of Tender obtained, on deposit of One Guinea (which will be returned on receipt of a bonâ-fide Tender) on application to Mr. G. WILLIAM LACEY, C.E. Borough Engineer and Surveyor, Guildhall, Oswestry.

Tenders, duly sealed and endorsed "Tender for Market Extension," are to be delivered to the undersigned not later than MONDAY, the 8th day of JANUARY, 1900.

The Council do not bind themselves to accept the lowest or any Tender.

J. PARRY-JONES,
Town Clerk.

Town Clerk's Office, Oswestry,
December 12th, 1899.

[*See also page* viii.


# COPPER ROOFING

**As Economical as Lead.**

**For Flats, Towers, Domes, Flèches, Mansards, &c.**

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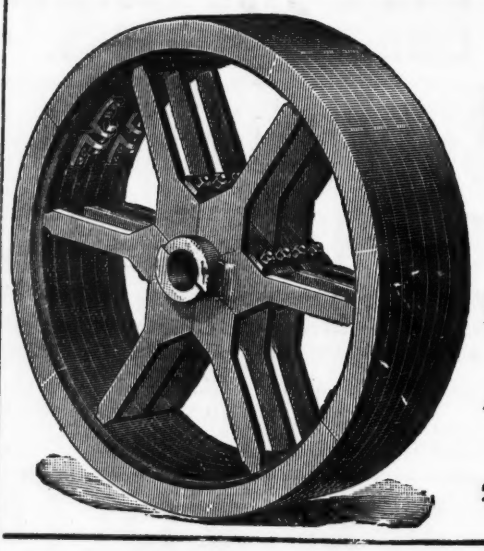

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BURN DAY and NIGHT.

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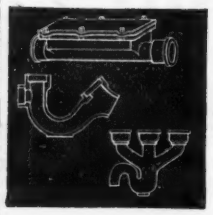

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# PORTLAND CEMENT.

Messrs. FAIJA'S Test, over 400 lb. per square inch for seven days.

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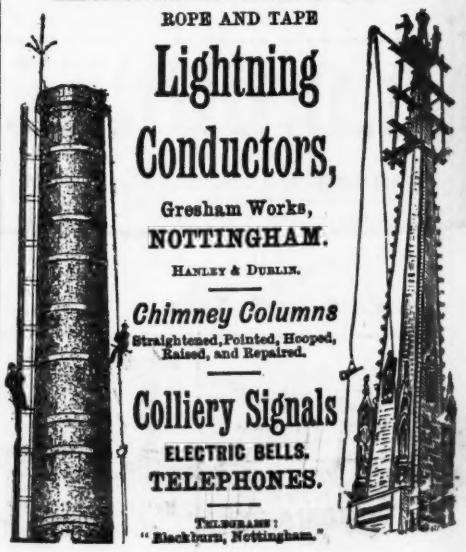

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Fixings should be included in Building Plans.

Consultations and Estimates free.

No interference with roof or pavement obstruction.

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*Inventor and Patentee* } **EDWIN PALMER, 250, Westminster Bridge Road, S.E.**

Telephone No. 1,156, "Hop." Telegrams, "Wireway, London."

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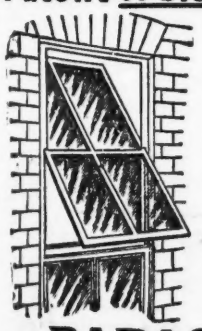
# Patent Welded Wrought-iron Casements, Sashes

AND

## VENTILATORS



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*These Casements are absolutely AIR-TIGHT and WATERTIGHT.*

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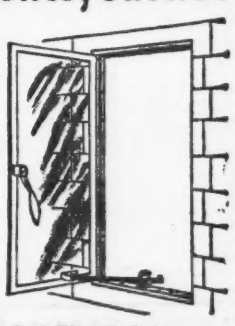

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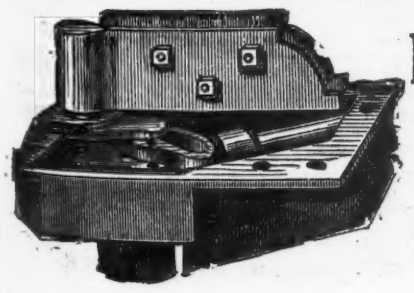

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## Patent Door-Spring & Check

**FOR CLOSING DOORS,**

WORKING ONE OR BOTH WAYS WITH ABSOLUTE SILENCE.

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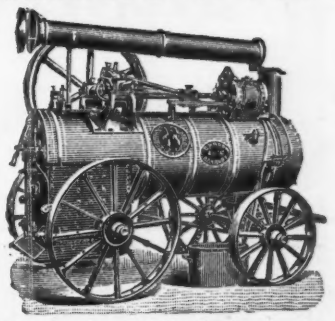

Portable Engines, 5 to 25 h.-p. always in stock, ready to load up at a moment's notice; also Mortar Mills, Mortar Carts, and Saw-benches.

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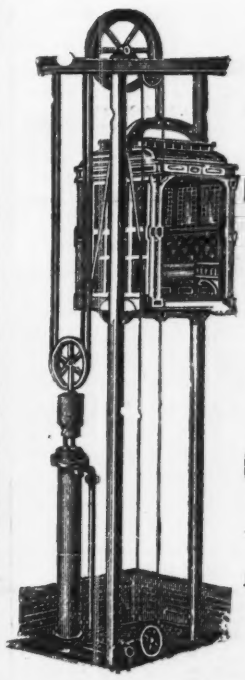

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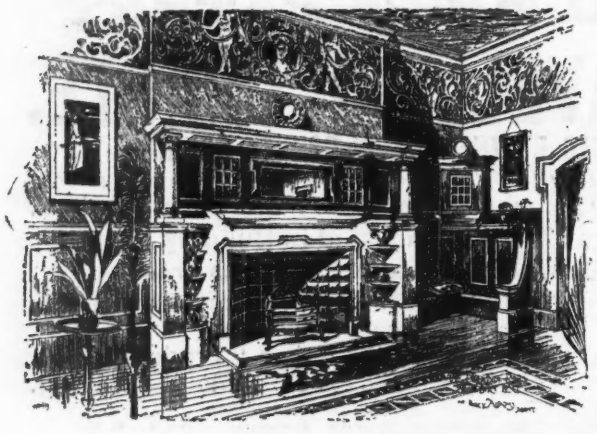
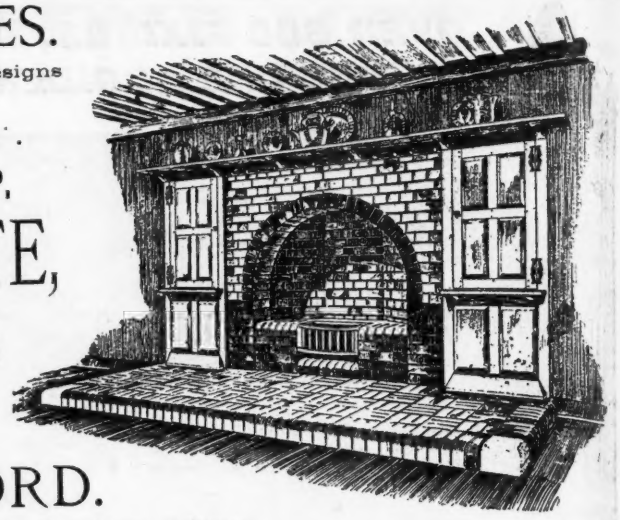


Catalogues of designs by well-known Designers on Application to . .

JOHN P. WHITE,

The Pyghtle Works,

BEDFORD.



**Manufacturer of every description of High-Class Joinery.**

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OLD AND COSTLY METHOD OF TESTING

**IN PATENT COPPER ROPE OR TAPE.**

## NEWALL'S CONDUCTORS

Are the most reliable, most effective, and cheapest offered to the public.

**Sole Manufacturers of Vyle's Patent (Easily Tested) Lightning Conductors. Fixed Complete by experienced workmen and their efficiency tested by competent electricians.**

**Makers of Every Description of Superior Quality Manilla Fall Ropes, Scaffold Cords, Patent Non-Rotating Flexible Steel Crane Ropes, Gilt and Silver Cord for Hanging Pictures, Iron, Steel, and Copper Cord for Clock and Sash Lines, &c.**

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**DIXON & CORBITT and R. S. NEWALL & CO., Ld.**

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*London Stores:—130, STRAND, W.C., and 73, GARFORD STREET, E.*


**CONTRACTS** (*continued from p.* vi.)

## TO BUILDERS.

The Guardians of the Parish of Willesden desire to receive TENDERS for FOUNDATIONS, ROADWAYS, and MAIN DRAINAGE for their proposed new Infirmary, Acton Lane, Willesden.

Persons desiring to Tender may obtain bills of quantities and a form of Tender, and inspect the specifications and drawings any day from 1st to 6th JANUARY, 1900 (both days inclusive), between the hours of TEN a.m. and FOUR p.m. (Saturday till ONE p.m.) upon application to the Guardians' Architect, Mr. A. SAXON SNELL, F.R.I.B.A. of 22, Southampton-buildings, Chancery-lane, London, W.C. and depositing with him a 10*l.* Bank of England note, which will be returned to persons sending bonâ-fide Tenders in the manner and at the time stipulated.

Quantities by Messrs. NORTHCROFT, SON, & NEIGHBOUR.

Tenders must be signed, sealed, endorsed "Tenders for Infirmary," addressed, and delivered to me at my Offices not later than TWELVE o'clock noon on WEDNESDAY, JANUARY 17th, 1900.

The Guardians do not bind themselves to accept the lowest or any Tender.

By order,
J. HUTTON HAYLOR,
Clerk to the Guardians.

Guardians' Offices,
No. 329, High-road,
Kilburn, N.W.
December 20th, 1899.

## SHEFFIELD UNION.

NURSES' HOME AND INFIRMARY LAUNDRY AT FIR VALE WORKHOUSE.

The Guardians of the Sheffield Union invite separate TENDERS from building contractors, for the whole of the works required in the ERECTION, of (1) a NURSES' HOME, and (2) a LAUNDRY, in connexion with the Workhouse Infirmary at Fir Vale, Sheffield, in accordance with plans and specifications prepared by Mr. EDWARD W. MOUNTFORD, F.R.I.B.A. Architect, 17, Buckingham-st. London.

Plans and specifications may be seen, and quantities and forms of Tender obtained, at the Union Offices, Westbar, Sheffield, on payment of a deposit of 1*l.* 1*s.* which will be returned on receipt of a bonâ-fide Tender.

Tenders must be sent to me here on or before TWELVE o'clock noon on SATURDAY, the 20th day of JANUARY, 1900. The contract will contain the fair contract clause adopted by the Sheffield Board of Guardians, a copy of which will be supplied, and the Guardians do not bind themselves to accept the lowest or any Tender.

By order of the Board,
ALBERT EDWD. BOOKER,
Clerk to the Guardians.

Union Offices, Westbar, Sheffield,
December 18th, 1899.

## OXFORD SCHOOL BOARD.

TO BUILDERS AND CONTRACTORS.

The School Board of Oxford is prepared to receive TENDERS for the ERECTION of three blocks of SCHOOL BUILDINGS to be used as Boys' and Girls' and Infants' Schools (each with a Central Hall) and a Cookery School, the whole to be known as "The East Oxford Board Schools," in Union-street, Cowley-road, Oxford.

Persons desirous of Tendering for the erection of the above may inspect the drawings, specifications, and conditions of contract at my Offices, No. 1, St. Giles', Oxford, where also a copy of the bill of quantities may be obtained, on payment of 1*l.* 1*s.* any day after SATURDAY, DECEMBER 30th, which sum will be returned on receipt of a bonâ-fide Tender.

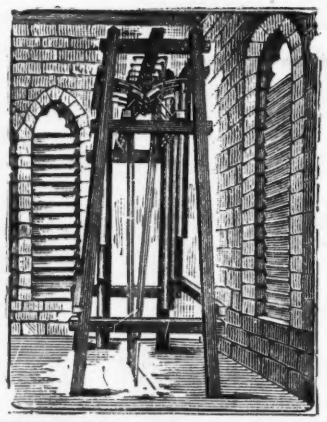
Sealed Tenders, endorsed "Tender for East Oxford Board Schools," to be sent to me not later than TWELVE o'clock noon on MONDAY, JANUARY 15th, 1900.

The Board do not bind themselves to accept the lowest or any Tender.

FRED. P. MORRELL,
Clerk to the Board.

Oxford,
December 28th, 1899.

*See also page* x.

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**ROPES FOR FALLS, SCAFFOLD CORDS, & SASH LINES.**

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All kinds of Yorkshire Stone and Paving.

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For Designs and Information, address Granite Works, Aberdeen, or No. 373, EUSTON ROAD, N.W. Columns and all circular work done at specially low prices by new patent process.

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Merchants in all kinds of STONE and GRANITE.

CAEN AND OTHER STONES FOR EXPORTATION.

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Office, 57, MILLBANK STREET, WESTMINSTER, S.W.

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**PENRYN, CORNWALL.**

London Office: 27, OLD QUEEN-STREET, WESTMINSTER, S.W. and W. & J. R. FREEMAN, 57, Millbank-street, S.W.

**CHILMARK and WARDOUR STONE QUARRIES, WILTS.**

PORTLAND SERIES, of which Salisbury Cathedral is built. Used in Restoration of Westminster Abbey, &c. &c.

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FOR ALL WINDOWS OR PARTITIONS IS

## FIRE-RESISTING.

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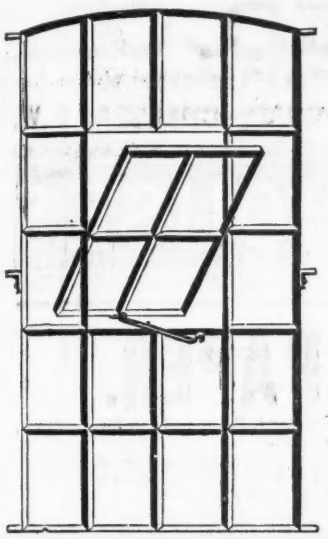

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## FRANCIS & CO. 64 to 70 (late 174), Gray's Inn-road, London.

MANUFACTURERS OF EVERY KIND OF

IMPROVED REVOLVING SHUTTERS, in WOOD, IRON, and STEEL.

SUITABLE FOR BANKS, MANSIONS, SHOPS, AND PUBLIC BUILDINGS.

*BRASS SHOP-FRONTS and SPRING SUN-BLINDS at REDUCED PRICES.*

ESTIMATES AND PRICE LIST FREE.

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REGISTERED DESIGN.

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## COUNTRY PARSON'S STOVES.

*New and Original Designs always being produced.*

Architects and Builders are invited to inspect our

*NEW WEST END SHOW ROOMS at*

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Where all our latest designs in tiled stoves, mantels, curbs, &c. may be seen.

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# ENGLISH MADE JOINERY & FITTINGS
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# PARKER'S JOINERY & CABINET Co. Ltd.
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Telephone No.: 480, King's Cross, LONDON.

QUOTATIONS GIVEN FOR JOINERY IN HARD AND SOFT WOODS.

Telegraphic Address: "Nidorose," LONDON.

Parker's Works, Birmingham, have the LARGEST & MOST UP-TO-DATE PLANT of MACHINERY in the United Kingdom.

Telegrams: "Hortulanus, London." **J. WEEKS & CO. LTD.** Telephone: No. 728, Kensington.

**Horticultural Builders and Hot-Water Engineers,**

A. W. G. WEEKS, F.R.H.S., A. O. LAUNDERS, } *Managing Directors.* 124, KING'S-ROAD, and 48, FERNSHAW-ROAD, CHELSEA, S.W.

# CONSERVATORIES & HOTHOUSES


**CONTRACTS** (*continued from p.* viii.).

PADDINGTON.

Notice is hereby given that the Vestry of the Parish of Paddington are prepared to receive TENDERS from parties willing to contract for the EXECUTION of the ORDINARY DAY and JOBBING WORKS required to be performed in Constructing, Altering, Rebuilding, and Cleansing Sewers, Drains, Gullies, Water Closets, Privies, &c. within the Parish.

The Contract to be for one, two, or three years (to be decided by the Vestry) from Lady Day next, the expenses of preparing the same to be borne by the Vestry.

Specifications and forms of Tender may be had on payment of Twenty shillings per copy (which will be returned) and further particulars obtained in the Surveyor's Office at the Vestry Hall, Harrow-road, between the hours of TEN a.m. and FOUR p.m. (Saturdays, TEN a.m. and ONE p.m.).

Tenders sealed and directed to the Vestry, to be left at the Vestry Hall aforesaid before TWELVE o'clock noon on MONDAY, 15th JANUARY, 1900, after which no Tender will be received. At the same time a Twenty Pound Bank of England Note (not to be enclosed with the Tender) must be lodged with the Vestry Clerk as evidence that the Tender is made bonâ-fide, the same to be returned immediately to the parties whose Tenders are rejected, but in the case of the party whose Tender is accepted, to be retained until the contract be signed.

If the Tender be withdrawn after its acceptance by the Vestry, the deposit will become forfeited.

The party whose Tender is accepted must provide two sureties in the sum of 500*l.* jointly and severally for the due performance of the contract.

The Vestry do not bind themselves to accept the lowest or any Tender.

By order,
FRANK DETHRIDGE,
Vestry Clerk.

Vestry Hall,
Harrow-road, W. London.
December 23rd, 1899.

THE ABERYSTWYTH and CHISWICK ELECTRICITY SUPPLY CORPORATION, Limited, 3, Crown-court, Old Broad-street, E.C. invite TENDERS for the ERECTION of a GENERATING STATION at Chiswick, on land adjoining Messrs. Thornycroft & Co.'s Shipbuilding yards.

Specifications, bills of quantities, and forms of Tender, may be obtained and plans inspected at the Offices of the Company's Engineers, Messrs. KINCAID, WALLER, & MANVILLE, 29, Great George-street, Westminster, on payment of a fee of three guineas, which will be returned on receipt of a bonâ-fide Tender.

The Company do not bind themselves to accept the lowest or any Tender, and the Contractor whose Tender is accepted shall enter into a formal agreement under seal, with sufficient sureties for the due performance of his contract.

Sealed Tenders endorsed "Electricity Supply.—Tender for Contract No. 4," must be delivered to me before NOON on the 15th day of JANUARY, 1900.

(Signed) G. WYATT-WILLIAMS,
Secretary.

The Aberystwyth and Chiswick Electricity Supply Corporation, Limited, 3, Crown-court, Old Broad-street, E.C.
December, 1899.

TO QUANTITY SURVEYORS.

The Lighting Committee of the Shoreditch Vestry invite TENDERS from Quantity surveyors for doing the necessary work in connexion with the ERECTION of NEW ENGINE HOUSE, BOILER HOUSE, OFFICES, &c. estimated value of works about 25,000*l.* Terms and full particulars, on forms to be supplied, are to be sent in not later than NOON, WEDNESDAY, 3rd JANUARY, sealed and marked "Quantity Surveyors," and addressed, Chairman of Lighting Committee, Shoreditch Vestry Electric Light Station, Coronet-street, N.

Forms of application can be had on application to the Chief Electrical Engineer, C. NEWTON RUSSELL, Lighting Station, Coronet-street, N.

RURAL DISTRICT COUNCIL of the ISLE OF THANET.
TO CONTRACTORS AND OTHERS.

TENDERS are invited for the CARRYING-OUT of WORKS of SEWERAGE in the Parish of Garlinge.

Plans, &c. may be seen on and after the 1st JANUARY next at the Office of the Engineer, Mr. ALBERT LATHAM, M.Inst.C.E. Municipal Buildings, Margate, during the usual office hours, and specifications may be obtained from him on payment of 2*l.* 2*s.* which sum will be returned on receipt of a bonâ-fide Tender.

Sealed Tenders, marked on cover "Tender for Garlinge Sewerage," to reach me, through the post, not later than TWELVE noon of THURSDAY, the 18th JANUARY next.

CHAS. TAYLOR,
Clerk.

Rural District Council Offices,
Minster, nr. Ramsgate.
December 27th 1899.


# OAKEY'S GLASS PAPER.

Emery Cloth and Paper, Glass Cloth, and Flint Paper Cloth, Emery, Black Lead, Putty-Powder, Snake Stone, Second Grit, Polishing Lap for Marble Masons, &c.

**FLINT and GARNET PAPER IN ROLLS.**

50 yards long by 18 in., 20 in., 24 in., 30 in., 36 in., 40 in., 42 in., and 48 in. wide.

**"WELLINGTON" EMERY WHEELS.**

WELLINGTON EMERY & BLACKLEAD MILLS, Westminster Bridge-rd., London, S.E.


RURAL DISTRICT COUNCIL of HURSLEY.
TO BUILDERS AND CONTRACTORS.
BRIDGES AT BRAMBRIDGE.

The Rural District Council of Hursley are prepared to receive TENDERS for the RECONSTRUCTION of Two BRIDGES at Brambridge, situate between Winchester and Eastleigh, Hants.

Plans and specifications may be inspected at the Offices of the Engineers, Messrs. LEMON & BLIZARD, Lansdowne House, Castle-lane, Southampton, and copies of the quantities obtained upon depositing the sum of Two Guineas, which sum will be returned to all persons making a bonâ-fide Tender.

Sealed Tenders, endorsed "Tender for Bridges at Brambridge," to be delivered at my Offices, 19, St. Peter's-street, Winchester, on or before SATURDAY, the 27th day of JANUARY next.

The Council do not pledge themselves to accept the lowest or any Tender.

By order of the Council.
HENRY WHITE,
Clerk.

December 30th, 1899.

*Refer also to* "Too Late" *column, page* xviii.


# WOOD WORKING MACHINERY

Of all kinds, and with
EVERY RECENT IMPROVEMENT,
Can be seen and tested in Trial Shops.
A LARGE STOCK FINISHED and READY FOR IMMEDIATE DELIVERY.
Call or Write for Catalogue.

**SYDNEY BUTLER,** Park Works, GLASSHOUSE STREET, Vauxhall, S.E.
(Three minutes from Vauxhall Station, South-Western Railway).

HIRE! HIRE! HIRE!

HIGH-CLASS ENGINES, MORTAR MILLS, HOISTS, BRICK CRUSHERS, &c.
At Moderate Prices.
REPAIRS AND CASTINGS.

LEWIS & LEWIS, { Engineers and Ironfounders,
Townmead-road, Fulham, London, S.W.
Telegrams, "Lewises, London."
Telephone No. 552, Kensington.

MORTAR MILLS.—All Sizes in stock, of latest improved types.
FOR SALE OR HIRE.
HENRY SYKES, Ltd. } 66, Bankside, London, S.E. Telephone No. 563 Hop.

STONE-BREAKERS, hand, horse, or steam power, also MORTAR MILLS, and CONCRETE MIXERS. A few second-hand ones that have been out, for SALE, cheap. Also a BRICK BREAKING MACHINE, DISINTEGRATOR, and ENGINE let out on HIRE, with option of Purchase.—MASON BROS. (late S. Mason & Co.), Stone Breaking and Grinding Machine Manufacturers, Leicester.

FOR SALE or HIRE.
MORTAR MILLS, 5 ft. to 9 ft. pans.
BRICK BREAKERS, HOISTS, SAW BENCHES.
PUMPS, LOCO, STEAM CRANES.
PORTABLE, HORIZONTAL, and VERTICAL ENGINES and BOILERS, 2 to 30 h.p.
EVERY DESCRIPTION OF BUILDERS' CONTRACTORS', and SAW MILL MACHINERY, New and Secondhand.
REPAIRS and CASTINGS.
E. HOUGHTON BROWN, M.I.M.E.
KINGSBURY IRON WORKS, BALL'S POND, LONDON, N.
Telegraph "Spherulite, London" Telephone No. 59038.

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MANAGER: R. SHOULER.

PLUMBERS' MATERIALS of every description.
Sheet Lead, Pipe, &c. at lowest market prices.
Ring up 5,408 Gerrard, or wire "Reorganise, London," or post 92, Berwick Street, W.

ENGINEERS' & CONTRACTORS' CASTINGS.
ASHTON & GREEN IRON CO.
will be pleased to give quotations for these and for machined castings, for prompt delivery, from their London Iron Foundry
All communications to the Head Offices:
11, 12, 13, and 14, Bury-street, St. Mary Axe, E.C.

BRICKS, STOCKS, GRIZZLES, PLACE, &c. No. 1 ROUGHS FOR SALE. Special quotations.—Apply, THE ROCHFORD BRICK CO. Rochford, Essex.

FOR SALE, about 400,000 Second-hand BRICKS. Could be removed by barge.—Apply, 151, Grove-street, Deptford.


*Refer also to* "Too Late" *column, page* xviii

# KING & SCARBOROUGH

## WALTHAM CROSS, HERTS.

(AND AT BRIDGE WHARF, 240, KINGSLAND ROAD, LONDON, N.E.)

# HIGH-CLASS JOINERY

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Telephone No. "1, Waltham Cross."

IN DEAL, PINE, PITCH PINE, AMERICAN WHITEWOOD, WAINSCOT OAK, MAHOGANY, TEAK, WALNUT, OR ANY OTHER WOOD.

***Every description of Joinery Work for Public Buildings, Churches, Banks, Mansions, Villas, &c., undertaken throughout and fixed if required.***

SHOP FRONTS and FITTINGS, BANK and OFFICE FITTINGS, STAIRCASES, PANELLING, PARTITIONS, SASHES and FRAMES, DOORS and FRAMES, CONSERVATORIES, ENTRANCE GATES, &c., &c.

**SPECIAL MOULDINGS TO ANY DESIGN.** **TURNING OF EVERY DESCRIPTION.**

The works are one of the most extensive, and certainly the most completely up-to-date in the kingdom. They cover 7 acres, and are fitted throughout with modern machinery and every possible labour-saving appliance.

**N.B.—Waltham Cross is only 10 miles from London. Frequent trains leave Liverpool Street Station (Gt. Eastern Railway), the most convenient being the 2.15 p.m., arriving at 2.35. The works are within five minutes' walk of Waltham Cross Station.**

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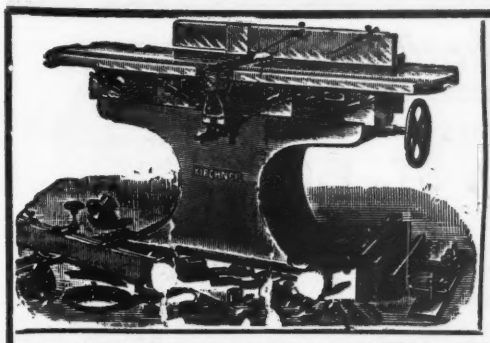

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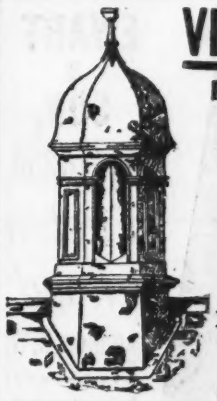

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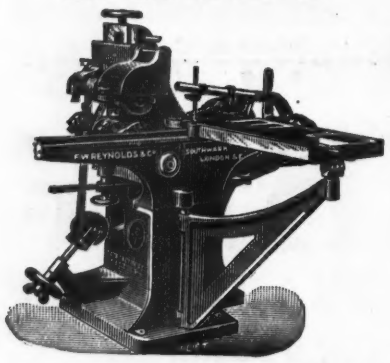

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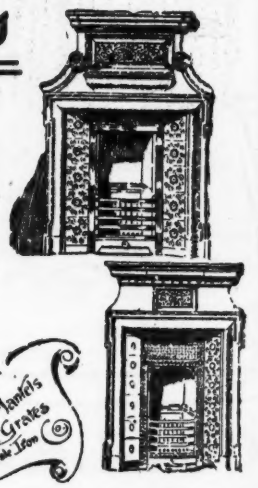

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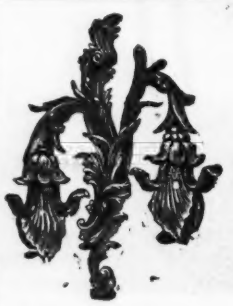

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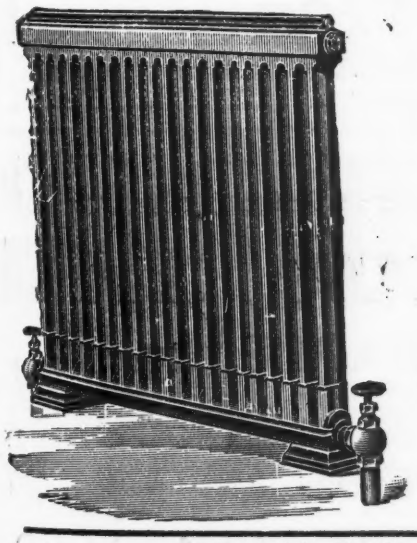

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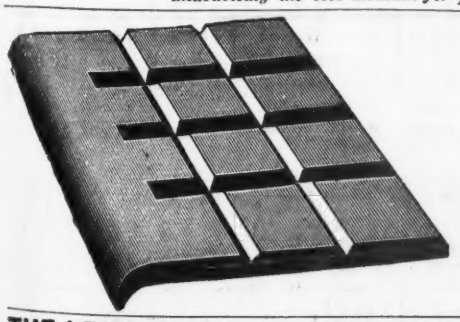

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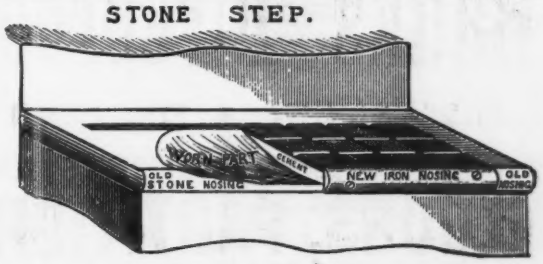


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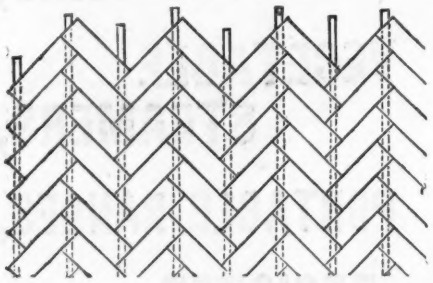

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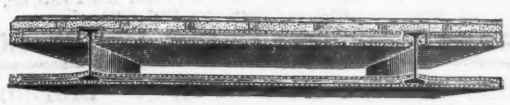

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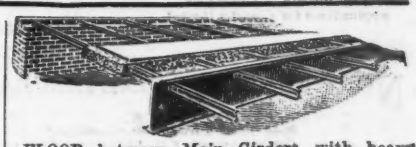

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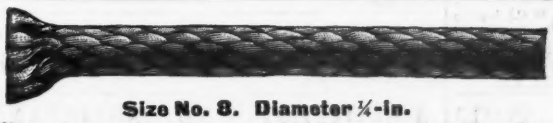

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TO QUANTITY SURVEYORS.
The Vestry of Fulham invite APPLICATIONS from SURVEYORS to TAKE-OFF the QUANTITIES for the New Baths and Washhouses to be erected at an estimated cost of 35,000l.
Applicants must state explicitly the terms in which they would be prepared to carry out the work. Preference will be given to surveyors who have had experience in taking off quantities for public baths and washhouses.
Applications are to be delivered to the undersigned, endorsed "Application for Quantity Surveyor," not later than TWELVE o'clock noon on SATURDAY, the 6th JANUARY, 1900.
W. J. H. DENSELOW,
Clerk to the Vestry.
Town Hall, Walham Green,
Fulham, S.W.

EAST HAM URBAN DISTRICT COUNCIL.
The East Ham Urban District Council invite APPLICATIONS for a first-class DRAUGHTSMAN and MEASURER in the Surveyor's Department. Candidates must be of good general all-round training, proficient in the preparation of architectural and other working drawings, and particularly expert and accurate in taking out quantities for buildings, sewerage works, &c.
The person appointed will be required to assist generally in the work of the Department.
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Applications, in candidates' own handwriting, stating age, experience, and qualifications, accompanied by copies of not exceeding three recent testimonials (which will not be returned), to be sent in addressed to the Chairman of the Works Committee, Public Offices, East Ham, E. and endorsed "Assistant," not later than the 9th day of JANUARY, 1900.
Canvassing the members of the Council either directly or indirectly is strictly prohibited and will disqualify any candidate.
By order,
C. E. WILSON,
Clerk to the Council.
Public Offices,
East Ham, London, E.
December 20th, 1899.

COUNTY BOROUGH of CARDIFF.
The Corporation of Cardiff invite APPLICATIONS for the APPOINTMENT of ARCHITECTURAL ASSISTANT in the Borough Engineer's Office. Salary, 2l. 7s. 6d. per week.
Applicants must be fully qualified to prepare designs, working drawings and specifications, and be capable of taking out bills of quantities.
If further particulars are required, they may be obtained from the Borough Engineer, Town Hall, Cardiff.
Applications, stating age, general experience, past and present employment, accompanied by copies of not more than three recent testimonials (which will not be returned), must be delivered to me on or before the 10th JANUARY, 1900, endorsed, "Architect."
By order,
J. L. WHEATLEY,
Town Clerk.

COUNTY BOROUGH of ST. HELEN'S.
ENGINEER'S DEPARTMENT.
The Parliamentary Committee of the Borough of St. Helen's are prepared to receive APPLICATIONS for the APPOINTMENT of a DEPUTY SURVEYOR.
He must be well up in surveying and levelling, a fair draughtsman, able to prepare detailed estimates, and accustomed to the management of men.
Salary, 180l. per year.
Applications, stating age and experience, to be sent in to me on or before WEDNESDAY, the 10th JANUARY next, accompanied by not more than three recent testimonials.
GEO. J. C. BROOM,
Borough Engineer.
Town Hall, St. Helen's.
December 30th, 1899.

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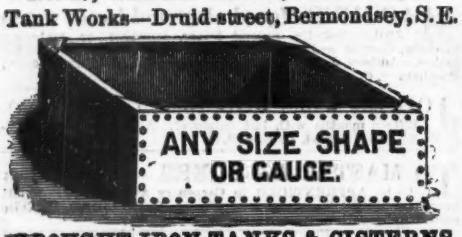


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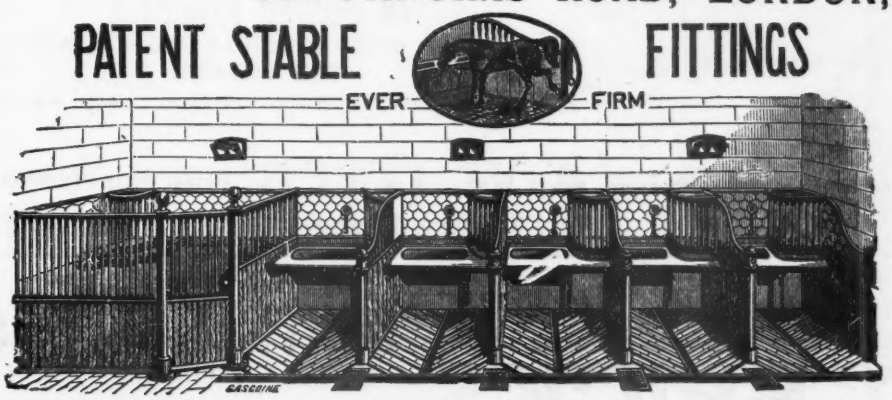


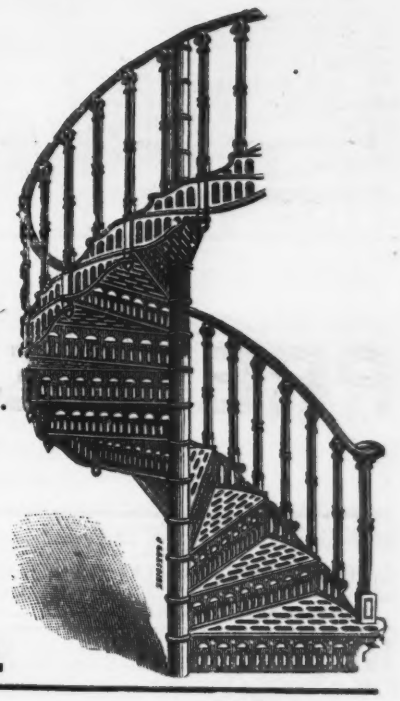

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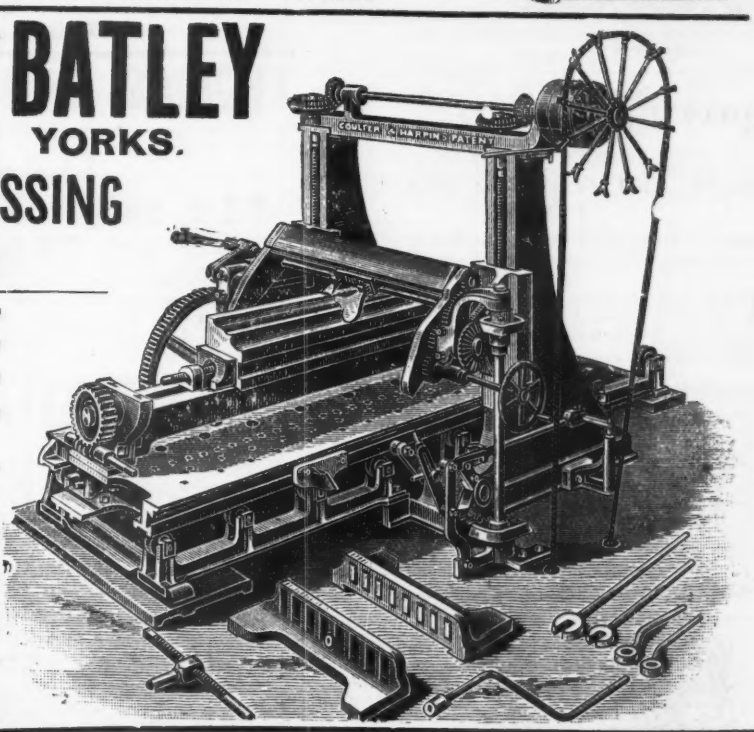


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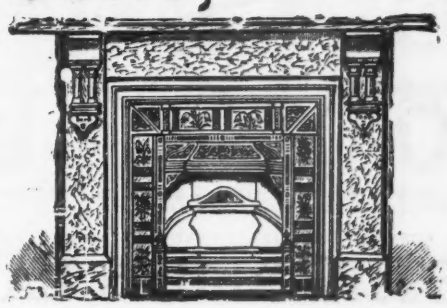

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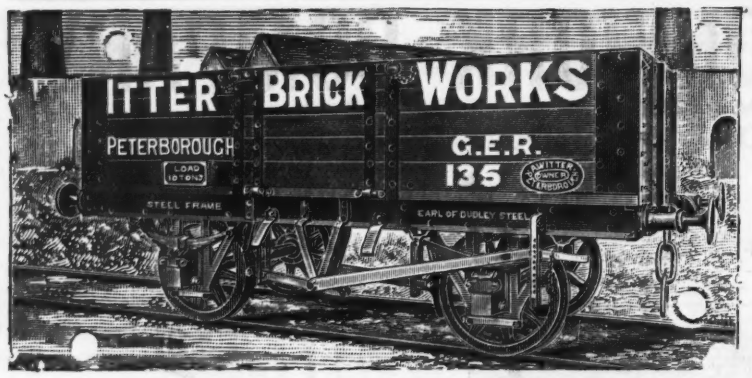


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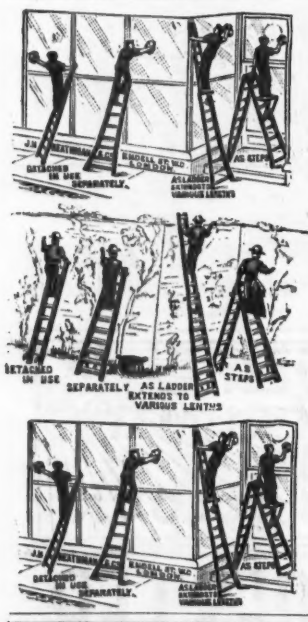


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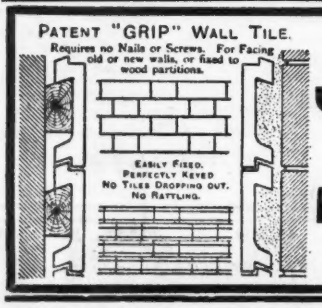
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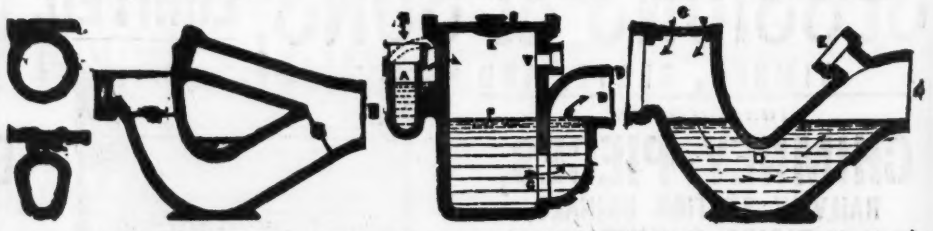

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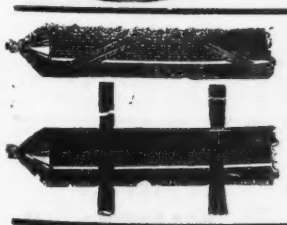

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*Refer also to* "TOO LATE" *column, page* xviii.

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**FREEHOLD BUILDING LAND,** suitable for Cottages, TO BE LET or SOLD, with advances to a respectable and responsible Builder. Roads and sewers constructed. Gravel soil.—Apply to Messrs. F. S. BRERETON & SON, Architects and Surveyors, 222, High Holborn, London, W.C.

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*Refer also to* "TOO LATE" *column, page* xviii.

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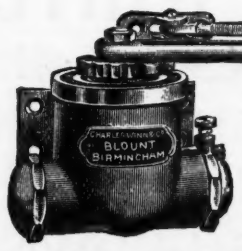


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Also of a durable highly-polished material called "MARBLETTE," suitable for Advertising Tablets, Signs, Facias, Direction Plates, Clock Faces, Mural Tablets, Tombstones, &c. This is supplied plain, embossed, or with incised gilt letters.
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31, CANNON STREET, E.C.
THREE HIGHEST AWARDS OBTAINED

**DAMP WALLS and DECAY in STONE, BRICK, etc.**
**PERMANENTLY CURED.**
BY
BROWNING'S
COLOURLESS PRESERVATIVE SOLUTION
As used on CLEOPATRA'S NEEDLE, and by
H.M. the QUEEN, BRITISH and FOREIGN GOVERNMENTS, etc.

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Regd.
## PATENT WOOD PRESERVATIVE.

**CARBOLINEUM AVENARIUS,** the well-known Wood Preservative, enters the wood by its own action, and does not require in its application any costly plant and machinery. Used by many London Vestries and Provincial Corporations for preserving wood street paving blocks.

**CARBOLINEUM AVENARIUS** entirely prevents dampness in brick and stone walls, also wet and dry rot in timber above or below ground, and is used by all the Railway Companies, and by leading Builders, Brewers, Contractors, Estate Agents, Mine Owners, &c., in the United Kingdom.

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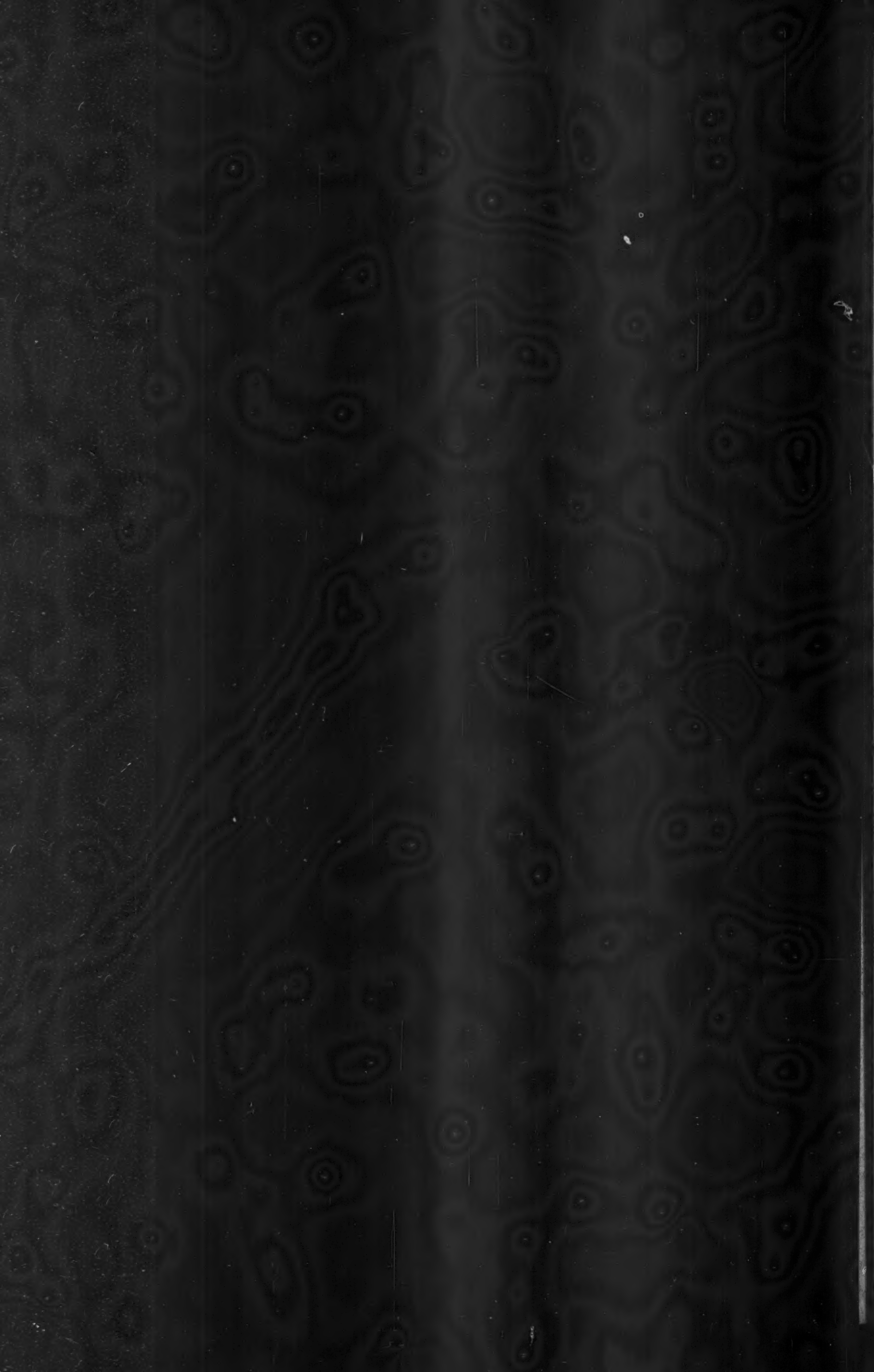

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## HEATING BY HOT-WATER.

## THE BOILER OF THE SEASON, KNOWN AS THE 'ECLIPSE.'

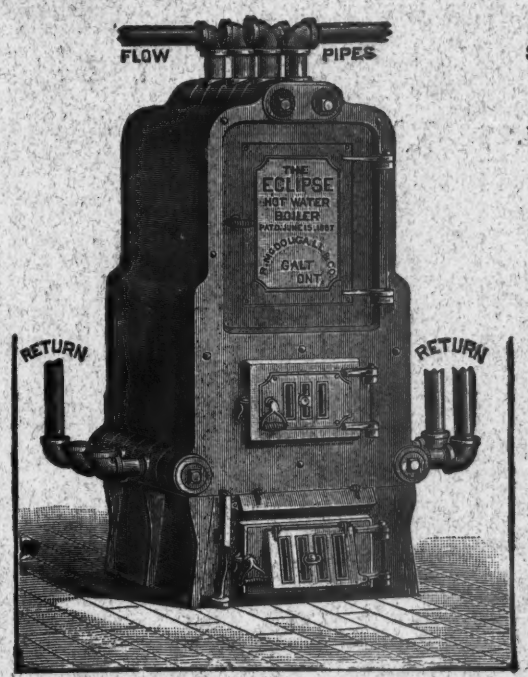



Fig. 1.—Showing Boiler finished and set up in position.

Stocked in Britain only by

YOUNG & MARTEN, Limited.

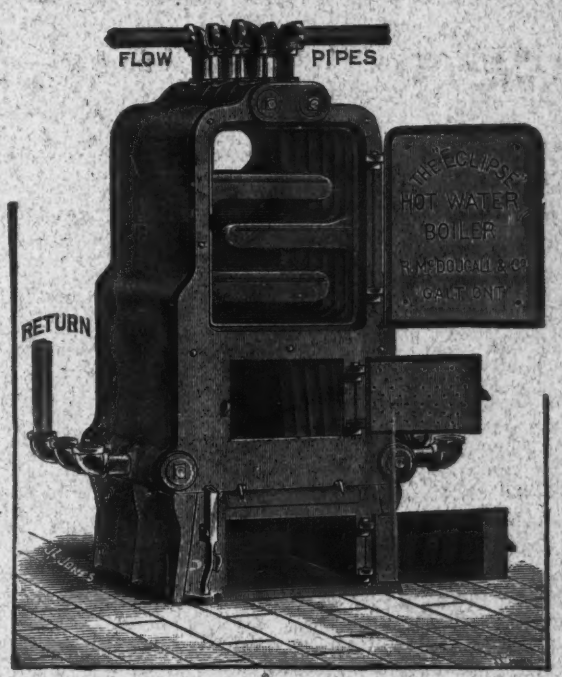
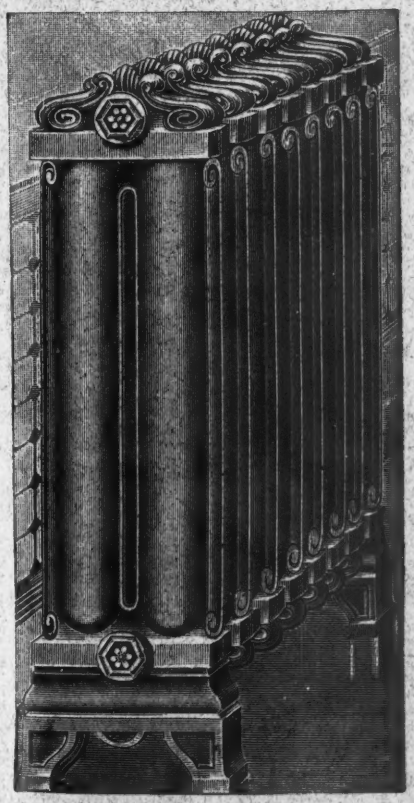



Fig. 2.—Showing construction of flues and easy access for cleaning the whole of Boiler.

RADIATORS FOR WATER OR STEAM.



## ADVANTAGES SEEN AT A GLANCE:

**Utmost possible surface of boiler in contact with fire.**

**Perfect regulation of Combustion.**

**Great saving of fuel.**

**Easily cleaned.**

**No flues can get choked.**

*We invite PLUMBERS, HOT-WATER ENGINEERS, and others interested, to apply for our*

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For Lighting Basements, Cellars, and Underground Apartments.

Universally acknowledged to be the Best.

Over 200 Underground Conveniences have been fitted with Hayward's Lights.

Cross Section through Hayward's No. 2B "Semi-Prism" Pavement Light.

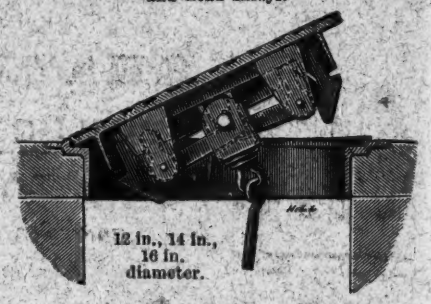
## Hayward's Patent Safety Coal Plates.

Self-Locking and Self-Fastening.

Used by all Local Boards and Vestries.

Solid Iron. Ventilating or Illuminating.

Also patent "Non-Slip" (new pattern) with Cement Face and Lead Inlays.



12 in., 14 in., 16 in. diameter.

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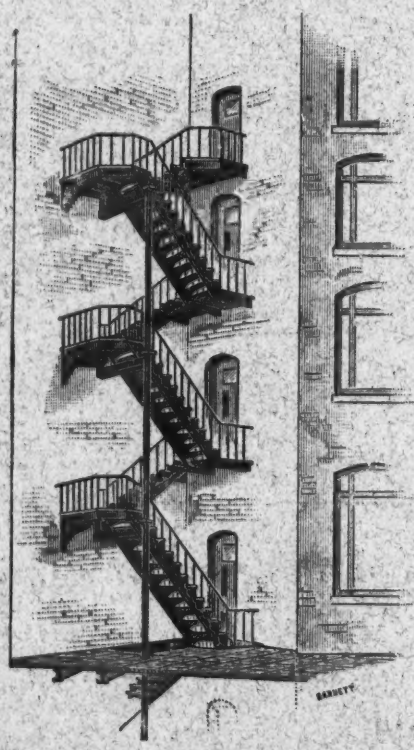
Supplied to County Council Requirements.

Non-Slipping Treads can be supplied to any kind of Staircase.



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IMPROVED IRON STAIRCASES.
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